UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Memorandum for: The Administrative Record

From: D. Robert Lohn

Subject: Comments on the 2007 Draft FCRPS Biological Opinion

Date: May 2, 2008

Introduction

This memorandum addresses the technical and policy issues relating to the October 31, 2007, Draft FCRPS Biological Opinion that were raised by states and tribes, groups and individuals listed below. NOAA Fisheries received detailed comments from 50 entities, from several individuals and over 18,000 form letters. Comments were due January 4, 2008, and were posted for public review at http://www.nwr.noaa.gov.

For the literature cited in this memorandum, please see Chapter 12 of the 2008 Supplemental Comprehensive Analysis.

Comments were received from the following entities:

Oregon
Washington
Montana
Idaho
Regional Coalition
Spokane Tribe
Colville Tribes
Nez Perce Tribe
Kootenai Tribe of Idaho
Columbia River Inter-Tribal Fish Commission
Idaho Rivers United
Save Our Wild Salmon
Northwest River Partners
Public Power Council
Columbia Snake River Irrigators Association
Inland Ports and Navigation Group
Shoshone-Bannock Tribes
Alaska Department of Fish and Game
Washington Farm Bureau
Native Fish Society
Lower Columbia River Estuary Partnership
Idaho Water Users

Attachment: Comments and Responses

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Issue 1: Jeopardy Standard

Comment 1-A *The legal standard should be a set of actions that "provide a trend toward recovery that, over time, is likely to fill the survival gap necessary for the species to persist." Oregon equates the ICTRT's 95% viability curve to constitute "basic viability"-- if achieved, "a population is not considered in jeopardy." NOAA Fisheries should demonstrate that there is a set of actions that improve the status sufficiently to completely achieve ICTRT viability (recovery) criteria within some unspecified time period, rather than demonstrating that the ESU will be improving but will not get all the way to viability (recovery) without additional survival changes. Oregon characterizes this as being a variation on the trend toward the recovery standard, not a new jeopardy standard: "NOAA Fisheries should revamp its approach to evaluating whether populations are likely to have sufficiently low short-term extinction risk and are likely to trend toward recovery."*

Response 1-A The ICTRT's gaps describe the survival improvements necessary for a population to achieve the abundance and productivity levels associated with viability. Viability criteria were developed by the ICTRT to serve as the biological requirements for long-term recovery, or delisting. Oregon seems to be equating delisting with avoidance of jeopardy. Delisting occurs according to the standards of ESA § 4 whereas the jeopardy standard is set by ESA § 7(a)(2), a different ESA provision. Thus the ICTRT viability criteria are different that the jeopardy standard. Also, Oregon's comment goes beyond the most conservative standard discussed in the remand collaboration – that the FCRPS would have to make up for "its share" of the 95% viability curve "gap" with actions implemented over the 10-year period and is inconsistent with the relevant analysis under ESA § 7(a)(2).

Issue 2: Jeopardy Analysis

Comment 2-A *The Save Our Wild Salmon Coalition comment that the NOAA Fisheries' jeopardy analysis is new and unprecedented.*

Response 2-A NOAA Fisheries' jeopardy and critical habitat analysis framework is described in Section 1.7 of the biological opinion for the FCRPS and Section 1.5 of the opinion for the USBR Upper Snake projects. This framework is derived from similar framework descriptions that appeared in the 1995 FCRPS Biological Opinion, pp. 10-15, and 2000 FCRPS Biological Opinion, Section 1.3. Changes from those earlier descriptions are intended to reflect guidance of intervening court decisions. The application of NOAA Fisheries' framework for applying the standards of ESA § 7(a)(2) further reflects the continuing accumulation of data and scientific analysis leading to a more refined understanding of the species' status and needs. In this manner, NOAA Fisheries develops its decisions to be consistent with the most recent legal interpretations of ESA authorities and the best science available, including NWF v. NMFS, No. 06-35011 (9th Circuit, April 24, 2008).

Comment 2-B *The Save Our Wild Salmon Coalition suggest that the jeopardy analysis did not adequately consider the expectations for recovery because NOAA focused on viability of salmonid populations and did not consider the actions' impacts on the species potential for recovery. SOS Viability Issues Paper (5/8/2006), p. 6, incorporated by reference into the SOS comments.*

Response 2-B NOAA Fisheries agrees that a focus on the viability of an individual salmon population does not completely inform the probability of the species' eventual recovery. As defined by the ESA regulations, §402.02, "'recovery' means improvement in the status of the listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Act." This is consistent with ESA §4(c)(2) where a determination to remove a species from the list "shall be made in accordance with the" listing criteria. NOAA Fisheries has stated that recovery depends on two types of criteria. "[E]valuating a species for potential de-listing requires both an explicit analysis of population or demographic parameters (biological recovery criteria) and also of the physical or biological conditions that affect the species' continued existence, categorized under the five ESA listing factors (listing factor criteria). Together these make up the "objective, measurable criteria" required under section 4(f)(1)(B)." (Please see "Adaptive Management for ESA-Listed Salmon and Steelhead Recovery: Decision Framework and Monitoring Guidance," May 1, 2007 (NMFS 2007b).

"Viability criteria" have been developed by the Interior Columbia Technical Recovery Team (ICTRT 2007a) to "inform long-term regional recovery planning efforts and delisting criteria." The viability criteria relate most directly to the biological delisting criteria; however, they are not synonymous. NOAA Fisheries establishes delisting criteria based on both science and policy considerations. For instance, science can identify the best metrics for assessing extinction risk and thresholds of those metrics associated with a given level of risk, but setting the acceptable level of risk for purposes of the ESA is a policy decision."

NOAA Fisheries evaluates the potential for recovery for each ESU/DPS under the effects of the Prospective Actions in its biological opinions. Its determination of whether there will be an "adequate potential for recovery," as discussed in Section 1.7 of the biological opinion for the FCRPS and Section 1.5 of the opinion for the USBR Upper Snake projects, takes into account both types of recovery criteria, both biological criteria (informed by viability analyses) and listing factors relevant to each listed species.

In further response to this comment, descriptions of NOAA Fisheries' jeopardy analysis in the biological opinions for the Prospective Actions have been revised to make clear NOAA Fisheries' consideration of listing factors when evaluating the recovery prong of the jeopardy analysis.

Comment 2-C *Oregon and CRITFC suggest using longer base time periods, in some cases extending back to the 1950s or 1960s, based on a suggested figure provided in Oregon's comments.*

Response 2-C As discussed in Section 7.1.1 of the SCA, NOAA Fisheries continues to use the 1980-present time period because the ICTRT uses this time period, which facilitates comparisons with recovery planning analyses, and because it corresponds approximately with that considered in the 2000 FCRPS Biological Opinion. This time period was considered long enough to encompass variability in climate and biological performance, but short enough to support a key assumption for all analyses in the stationarity of the underlying processes, i.e. that the environmental conditions affecting the species today also were in effect over the time period, as for example the number of mainstem dams which have not changed since 1980. Thus, the stationarity assumption is supported by using a sufficiently recent period that includes many of the major changes in management actions that have occurred in recent decades. NOAA Fisheries used the most recent data available from the ICTRT.

Comment 2-D *Oregon states that there is "inherent bias [in all three productivity metrics] due to substantial short-term increases in abundance at the end of the base period," thereby implying that these years should be dropped and the base period should be shortened.*

Response 2-D The "short-term" increase in abundance late in the base period has little to do with statistical significance or bias. As Paulsen et al. (2007) demonstrated, high variability is inherent in salmon survival and hence numbers of returning adults. This is not a bias; high variability is a characteristic of most salmon populations. This makes accurate estimation of trend difficult. However, it is not possible to come up with a more statistically precise estimate of trend than is used in the SCA. The only way to improve the accuracy is to collect more data. Using all of the most recent years available increases the number of statistical "degrees of freedom," thereby increasing the precision of the estimate. Eliminating data in the later part of the data series is unwarranted because it reflects the true variability inherent in the spawner series. It is true that choice of time period has a strong effect on the estimate of lambda, which is why there must be an objective and consistent rationale for choice of the time period, as described above in Response 2-A and in Section 7.1.1 of the SCA. The other two productivity estimates are less influenced by the choice of time period.

Comment 2-E *The Nez Perce Tribe contends that the base period should extend through 2006, or at least the data sets used should be clearly labeled.*

Response 2-E NOAA Fisheries labeled the data sets in the new tables (e.g., SCA Table 8.3.2-1). All estimates go through most recent year reviewed and are incorporated into ICTRT data set. The most recent year is generally 2004 or 2005, although a few estimates are available for 2006 (e.g., Tucannon Chinook and Upper Grande Ronde steelhead). NOAA Fisheries relied on data from the ICTRT because the ICTRT reviews the data for accuracy and consistency with methods and estimates in the full time series.

Comment 2-F *The Nez Perce Tribes suggests that the base period should be anchored—not changed again until 2017.*

Response 2-F NOAA Fisheries will be receiving updated return information as the Biological Opinions are implemented and will have to take that information into consideration during the implementation period. The original base period information will always remain available to inform future analyses as necessary.

Comment 2-G *Oregon suggests that NOAA Fisheries evaluate a 100-year extinction risk time horizon, rather than a 24-year period, or else set standards for both periods. The rationale was that the 24-year extinction risk is lower than the 100-year extinction risk (i.e., it "inflates" survival probability compared to the 100-year time horizon).*

Response 2-G

As discussed in Section 7.1.1.1 of the SCA, it has been well documented that extinction risk increases with longer time horizons, with the probability of extinction "approaching 100% for all species if the period is long enough" (NRC 1995). Thus, the lower risk associated with a 24-year period is not an artificial inflation, as Oregon claims, but is a simple function of mathematics. The 100-year time period would also appear inflated if compared to a 500-year time period. It has been equally well-documented that the precision of the risk estimate decreases with longer time horizons. For example, Fieberg and Ellner (2000) estimated that reliable estimates of extinction risk may only be possible when the number of base period observations is 5-10 times greater than the number of years in the time horizon.

NOAA Fisheries continues to rely primarily on the 24-year time horizon for this analysis because the main purpose of the metric is to inform our judgment regarding the ability of the species to survive while actions to promote recovery are implemented under the Prospective Actions and through other processes. However, NOAA Fisheries did calculate extinction risk over the 100-year time horizon to allow comparison of the 24-year extinction risk results with the 100-year extinction risk results of interest to some parties in the region. The 100-year extinction risk estimates and associated confidence intervals are reported in the Aggregate Effects Appendix.

Oregon's comments include an analysis that shows a low likelihood of extinction over 24 and 48 years and a high likelihood of extinction over 100 years for some populations, including Upper John Day spring Chinook. The John Day spring Chinook population is not listed under ESA, and is considered by the state of Oregon to be healthy (Oregon Native Fish Status Report: http://www.dfw.state.or.us/fish/ONFSR/report.asp and http://www.dfw.state.or.us/fish/ONFSR/final/03-spring-chinook/sc-summary-mid-col.pdf). While NOAA Fisheries is not familiar with the data or assessment methodology used in this 100-year extinction risk estimates for this population, the result suggests that even healthy salmon stocks may appear to have a high likelihood of extinction under this assumption.

Comment 2-H

CRITFC, the Nez Perce Tribe, and the Spokane Tribe comment on the 2007 Draft Biological Opinion suggesting adoption of an explicit abundance metric and abundance "performance standards," as discussed in Section 7.1.1.2 of the SCA. Discussions with Nez Perce Tribal staff clarified that they are primarily interested in tracking abundance during implementation of the Prospective Actions and comparing it to benchmarks such as the ICTRT's abundance viability thresholds, rather than recommending a prospective analysis of the probability of reaching a particular abundance level under the Prospective Actions.

Response 2-H Reporting requirements during implementation of the Prospective Actions are described in Chapter 2 (Upper Snake Proposed Action) and/or Chapter 4 (FCRPS RPA) of the biological opinions associated with each of the Prospective Actions, and it is anticipated that population status, including abundance, will be reported. However, there is no specific abundance "metric."

These comments do point to a larger issue regarding the relationship between the productivity metrics included in this analysis and population abundance. As described in Section 7.1.1 of the SCA, the estimates in this analysis represent the initial productivity that would be expected following an instantaneous survival rate change. That initial change in productivity would lead to greater abundance of spawners, which in turn would lead to density-dependent interactions that would reduce the average productivity rate over time. The ICTRT and Zabel (2007) used a matrix simulation model to analyze the expected changes in productivity and abundance over time for a few populations with sufficient data, following incremental changes in FCRPS hydro survival. Three examples for populations of SR spring/summer Chinook salmon are displayed in Figures 7.1-5 through 7.1-7 of the SCA. These examples compare the initial productivity (R/S) calculated by the proportional change method with average R/S (which decreases) and spawner abundance (which increases) over time, projected by the simulation model.

Comment 2-I *The Nez Perce Tribe, Oregon, and CRITFC suggest an alternative goal of achieving the ICTRT's 5% abundance/productivity goal, which represents a combination of reaching the ICTRT viability abundance threshold and of reducing extinction risk to 5% or less.*

Response 2-I As discussed in Section 7.1.1.2, this goal is associated with recovery and delisting in the Final Recovery Plan for Upper Columbia River Spring Chinook Salmon and Steelhead (NMFS 2007c) and in drafts of other Interior recovery plans. It therefore goes beyond the "potential for recovery" prong of the jeopardy standard and would require attainment of abundance and productivity associated with long-term recovery. NOAA Fisheries does not agree that a jeopardy determination depends on achieving this recovery goal. Nevertheless, NOAA Fisheries finds that it is relevant to compare survival changes expected from the Prospective Actions with the survival changes needed to attain this recovery goal. NOAA Fisheries provides this comparison information in figures in the Aggregate Analysis Appendix.

Comment 2-J *Oregon recommends that NOAA Fisheries pay closer attention to certain steps within the NWF v. NMFS remand collaboration process and set goals based on work products of the remand collaboration process. In particular, a collaboration workgroup prepared a report to support "Step 4" of the collaboration's analytical framework and attempted to apportion the ICTRT's survival gap among different sources of human-caused mortality, including the existence and operation of the FCRPS, based on the estimated magnitude of each source of mortality (Framework Work Group 2006).*

Response 2-J As discussed in Section 7.1.1.2 of the SCA, NOAA Fisheries does not consider the apportionment of survival gap responsibility of Step 4 of the Collaboration Framework to be relevant to a jeopardy analysis. Nevertheless, NOAA Fisheries presents results of a Step 4 analysis in the Aggregate Analysis Appendix so that they can be compared with this alternative goal. The specific estimates of needed survival change are derived from the relative proportional impacts in Framework Work Group (2006) applied to the ICTRT's 5% viability gaps in an analysis presented in various chapters of the CA. The CA results are displayed in the Aggregate Analysis Appendix.

Comment 2-K *CRITFC and the Nez Perce tribe suggest that the R/S level associated with the recovery prong of the jeopardy standard should be 1.42, rather than 1.0, and that the estimated population growth rate (lambda) should be 1.08 . These productivity rates would result in doubling population size within two generations, or approximately 10 years.*

Response 2-K As discussed in Section 7.1.1.2 of the SCA, NOAA Fisheries defined the goal for this metric satisfied by a value greater than 1.0 since that would indicate that the population is growing toward recovery levels. Beyond this it is not possible to define a specific level greater than 1.0 that would be relevant to all populations, since they are all of different sizes, with different carrying capacities, and at different levels of current abundance versus carrying capacity. R/S, lambda, or BRT trend greater than 1.0 means, by definition, that a population is on average increasing in abundance. R/S greater than 1.42 simply means that the populations are increasing more rapidly. However, conclusions in the 2007 Draft Biological Opinion relied in part on estimates of R/S and other productivity measures being higher than 1.0 for many populations, and in some cases, the estimates were substantially higher than 1.42. NOAA Fisheries continues to conclude that a goal of R/S greater than 1.0 is reasonable, with consideration of the mix of populations at higher levels an important qualitative consideration for reaching species-level conclusions. NOAA Fisheries does note that results are presented in a manner that allows comparison to 1.42 or any other particular average R/S level of importance to parties in the region.

Comment 2-L *Oregon recommends that the "potential for recovery" prong of the jeopardy standard requires demonstrating with 95% confidence that the estimated productivity is greater than 1.0.*

Response 2-L The ESA does not specify a particular risk level for making an ESA § 7(a)(2) decision. The metrics NOAA Fisheries considered in this analysis are means or medians, which have at least a 50% probability of being above 1.0. NOAA Fisheries continues to display 95% confidence intervals where possible and, as discussed in Chapter 8 for each species, variability in the observed data leads to the lower 95% confidence interval generally being below 1.0 and the upper limit generally being above 1.0. As discussed in Section 7.1.1.2, NOAA Fisheries has included the probability that lambda will be above 1.0 in the Aggregate Analysis Appendix, in response to Oregon's and others' comments regarding uncertainty of estimates. It was calculated, using the methods in (McElhany and Payne 2006). NOAA Fisheries did not adopt a particular statistical standard and displays this metric only for comparison with alternative goals recommended by others. This metric was calculated only for lambda estimates, but because of the range of hatchery assumptions in the lambda calculations, the results are similar to those expected from both the R/S and BRT trend estimates.

Comment 2-M *Oregon, CRITFC, and the Nez Perce Tribe recommend that NOAA Fisheries use only a QET of 50 or higher (up to 100) in assessing extinction risk and disregard the sensitivity analysis of QET=30, 10, and 1. One of these comments stated that NOAA Fisheries did not provide adequate explanation for considering results less than QET=50 in reaching conclusions. On the other hand the Colville Tribes commented that QET=50 is conservative and recommended displaying and discussing QET=10 more prominently. The same commenter opined that the real ESA standard is absolute extinction (QET=1), not "entering a state where the risk of extinction cannot be modeled" (ISAB 2007c) definition of quasi-extinction threshold).*

Response 2-M As discussed in Section 7.1.1.1 of the SCA, NOAA Fisheries primarily considered QET=50 in evaluating extinction risk because this is the threshold used by the ICTRT for long-term extinction risk. For the reasons discussed above, this threshold may be overly conservative for smaller populations, particularly those that have demonstrated the ability to return to higher levels after dropping below 50 spawners (e.g., Figure 7-1.3 of the SCA), and it may also be conservative for short-term extinction risk since at least one of the ICTRT's reasons for QET=50 is related to long-term genetic considerations. Regarding suggestions for higher QET levels, a population of at least 50 spawners clearly has not gone extinct and no evidence was presented in comments to suggest that a population below some higher level (e.g., 100) will go extinct. Regarding emphasizing lower QET levels, NOAA Fisheries agrees that "true extinction" is defined as dropping to 0 or 1 spawner four years in a row. However, the ability of available data and models to accurately predict population behavior at this low level is extremely limited and the risk tolerance in such an analysis would have to be extremely low. It is reasonable to evaluate "quasi-extinction" thresholds above 1 fish, although there is little support for any particular level.

Comment 2-N *Oregon questions whether variability and autocorrelation were adequately considered in the extinction risk analysis.*

Response 2-N As discussed in Section 7.1.1.1 of the SCA, NOAA Fisheries agrees that variance and autocorrelation, the tendency to, for good or bad years, occur together in a series, are important parameters in any extinction risk analysis, and both were estimated and used in developing the extinction risk estimates. The nonlinear regression method for estimating these parameters was carefully developed and details of methodology are included in Hinrichsen 2008, which is attached to the Aggregate Analysis Appendix. That appendix also outlines how these estimates were used in developing estimates of extinction probability. In short, as variance increases and autocorrelation increase, extinction probability estimates increase.

Comment 2-O *Oregon suggests that use of the Beverton-Holt function "alpha" parameter to estimate the extinction risk survival gap under-estimates this gap, compared to the methods used by the ICTRT.*

Response 2-O As discussed in Section 7.1.1.1 of the SCA, this approach generally results in similar gaps for Chinook (using the Beverton-Holt function) as the ICTRT hockey-stock function and it generally produces larger survival gaps for steelhead (using a Ricker function) than the ICTRT method. Even for Chinook, the methods in the SCA can produce larger survival gaps, as can be seen by comparing the SR spring/summer Chinook base 100-year extinction risk gap at QET=50 in the Aggregate Analysis Appendix with the ICTRT (2007c) 5% risk "observed" survival gap. Most of the estimates differ only slightly between the two approaches, with approximately equal numbers being higher in one model or the other. However, there are five populations with significantly different survival gap estimates, all of which are much higher (i.e., a much greater improvement is needed) using the Beverton-Holt approach.

Comment 2-P *Oregon, CRITFC and the Nez Perce Tribe state that NOAA Fisheries needs to display uncertainty in all estimates and then include this in the aggregate estimates. They cite ICTRT saying that three 80% certain estimates equals one combined 50% certain estimate.*

Response 2-P Uncertainty in the SCA estimates is derived solely from the base period demographic information. NOAA Fisheries is not able to calculate uncertainty for most of the survival change estimates (e.g., habitat changes), so it is not possible to estimate the increased variance associated with the product of these estimates. For those estimates that are based on alternative assumptions (e.g., some hatchery survival changes and harvest changes), both estimates are included to define a range.

Comment 2-Q *Oregon states that "the gaps" cannot be closed by non-hydro actions, based on Petrosky et al. (2001), Wilson (2003), and Budy and Schaller (2007).*

Response 2-Q The Budy and Schaller (2007) paper only considers changes in tributary habitat survival when evaluating the ability of non-hydro actions to achieve long-term recovery, while the SCA analysis also considers reduced harvest, increased estuary survival, hatchery reforms for some populations, and prospective predation reductions in evaluating jeopardy criteria. As discussed in Section 7.1.1.2, the SCA analysis does not purport to meet either the survival or the "potential for recovery" prong of the jeopardy standard exclusively through non-hydro actions, so the comment addresses a non-existent problem. The combination of base-to-current and current-to-future hydro survival changes are significant for all interior Columbia species, including the SR spring/summer Chinook ESU that was the focus of the cited studies. More to the point, the reverse argument is also true: hydro actions alone are unable to meet long-term viability goals (ICTRT and Zabel 2007).

Furthermore the "gaps" evaluated in the cited papers do not correspond with the gaps necessary to avoid jeopardy in this analysis. The Budy and Schaller (2007) paper, for example, evaluates a goal of R/S = 1.9, which is about double the R/S>1.0 metric in the SCA analysis and the survival changes needed to achieve R/S=1.9 are generally higher even than the survival changes needed to achieve the ICTRT's 5% risk criteria associated with long-term viability for many populations.

Comment 2-R *The Shoshone-Bannock Tribes contend that the modeling used by the FCRPS to determine jeopardy will produce biased and inconsistent results, citing comments submitted by Charles Pace.*

Response 2-R None of Charles Pace's 5 comments on the Draft FCRPS Biological Opinion state that the analysis is biased or inconsistent.

Comment 2-S *Oregon states that the roll-up from populations to species should follow the ICTRT MPG scenarios.*

Response 2-S The ICTRT recommended viability scenarios (Attachment 2 of ICTRT 2007a) were prepared by the ICTRT to demonstrate how to apply its long-term viability (recovery) criteria to particular MPGs. As described in Section 7.1 of the SCA:

In contrast, this analysis is directed at a different question. This analysis focuses on the survival changes needed to ensure that populations, and ultimately support species (ESU or DPS) that are on a "trend toward recovery;" i.e., moving toward recovery even though full recovery of the species may not be achievable during the period of the Prospective Actions. In general, the needed survival changes for full recovery are higher than the needed survival changes associated with the "trend toward recovery."

Although NOAA Fisheries does not consider achievement of the ICTRT viability goals and viability scenarios a requirement for this consultation, the information in the viability scenarios is critical for understanding the relative importance of populations within MPGs when evaluating the "potential for recovery" prong of the jeopardy standard at the ESU level. As described in Section 7.3:

For species with sufficient data, NOAA Fisheries first describes the performance of each population within an MPG with respect to quantitative and qualitative indicators of short-term extinction risk and a trend toward recovery under the Prospective Actions. If there are differences in performance by population, we review the relative importance of each population to the MPG and ESU, based primarily on information from TRTs and recovery planning documents. For example, some populations may be particularly important because of unique life history characteristics, while others may be important because they are relatively large populations that represent the main repositories of fish in a given area. (Emphasis added).

For example, NOAA Fisheries reports abundance trends (BRT trends) by population and groups the population results by MPG. However, the abundance of individual populations is not added together to generate a single trend for the MPG because important information about the performance of populations relative to needs of the ESU would be lost. It is more important to know, for instance, that "5 of the six populations in an MPG are increasing," and which ones they are, than to know that the combination of all populations is increasing. An increasing trend of an aggregate MPG might be a result of one very large population growing, while the remaining smaller populations are declining. Those smaller populations may be critical to an assessment of the trend toward recovery for the MPG and ESU because of particular life history or habitat character.

Comment 2-T *The Save Our Wild Salmon Coalition, Idaho Rivers United, and the Native Fish Society express uncertainty about how effects from hatcheries were taken into account in the FCRPS Biological Opinion.*

Response 2-T Hatchery effects, together with other effects, are imbedded in the environmental baseline and are carried forward prospectively because the Proposed Action includes the continuation of funding pending the implementation of hatchery reforms. The hatchery Prospective Actions and other on-going hatchery improvement actions are important steps to reducing risk and assuring the long-term viability of these ESUs. NOAA Fisheries believes that these actions are necessary and valuable, and anticipates that they will yield major progress over the next several years with benefits extending into the future. However, by necessity, major hatchery reform of this kind requires detailed review of each of the individual hatchery programs. The results will be realized in reforms and improvements that are specific to the program involved. At this time, while the reform processes are already underway, it is not possible to anticipate exactly what those results might be for each of the programs. While we are confident that such reforms will occur, in most instances we are unable to quantify the benefits. The benefits and risks of new prospective hatchery actions that are specified in sufficient detail are considered in this Biological Opinion because we believe that integrated consideration of hatcheries is important to understanding these ESUs.

Issue 3: Comments on the Cumulative Effects Analysis

Comment 3-A *The Save Our Wild Salmon Coalition suggest that the cumulative effects analysis did not consider all effects of actions, including those with benefits and those that are adverse.*

Response 3-A NOAA Fisheries did not intend to limit its consideration of cumulative effects to those with benefits for listed salmon or designated critical habitat. In response NOAA Fisheries will revise its decision documents to clarify that activities meeting the definition of cumulative effects will include those likely to have adverse effects on listed salmon together with those likely to be beneficial or neutral. These cumulative effects are carried forward in the quantitative analysis as environmental conditions occurring in the past and "reasonably certain to occur" in the future, at least for the near term.

Issue 4: Comments on the Adverse Modification Analysis

Comment 4-A *The Save Our Wild Salmon Coalition suggest that the adverse modifications analysis needed refinements, including an explicit consideration of recovery. They suggest that the analysis should include how the Primary Constituent Elements (PCEs) are affected by the action, not whether the PCE can eventually be restored to fulfill its conservation role.*

Response 4-A NOAA Fisheries articulates its framework for applying the § 7(a)(2) standards, including the adverse modification of critical habitat standard, in Section 1.7 of the FCRPS Biological Opinion and Section 1.5 of the Upper Snake Biological Opinion. That framework requires a consideration of the conservation role of any PCEs of critical habitat that may be affected by the Prospective Actions. "Conservation" is defined in the ESA as ". . . to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act [ESA] are no longer necessary." "Recovery" is defined by the implementing regulations at 50 C.F.R. § 402.02 to mean "improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Act [ESA]." The two terms "conservation" and "recovery" are functional equivalents. Thus, NOAA Fisheries' application of the critical habitat adverse modification standard explicitly considers the recovery needs of the species and its critical habitat. NOAA Fisheries has added extensive descriptions of the status of PCEs in the environmental baseline section of each species chapter, described the effects of the Prospective Actions on habitat, and then translated this into effects on specific PCEs (safe passage, water quality, substrate, etc.) where applicable.

Issue 5: Comments on the Action Area

Comment 5-A *CRITFC suggests that the action area should contain all of the Canadian Columbia River Treaty Reservoirs because their operations impact salmon flows and power markets that have the potential to impact spill and other dam operations.*

Response 5-A NOAA Fisheries has properly delineated the action area to include those areas that are affected by the FCRPS. The action area includes those areas of occupied salmon habitat affected when Prospective Actions cause water to be released from Canadian reservoirs.

Issue 6: Comments on the RME Approach

Comment 6-A *CRITFC suggests that the BiOp needs a stronger commitment to abundance (status) monitoring and reporting including a commitment by FCRPS Action Agencies to work with states and tribes to put in place comprehensive status and trend monitoring program.*

Response 6-A The FCRPS Action Agencies have committed to, and NOAA is requiring as part of its RPA, enhancement of existing fish population status monitoring performed by fish management agencies through the specific actions listed in RPA Action 50. The FCRPS Action Agencies will ensure that ancillary population status and trend information will be obtained through several ongoing habitat and hatchery improvement projects (see project tables in Attachment B.2.6-1 to Appendix B of the FCRPS Action Agencies' August 2007 Biological Assessment). Also, the FCRPS Action Agencies will provide additional status monitoring to ensure a majority of Snake River B-Run steelhead populations are being monitored for population productivity and abundance.

RPA Action 50 requires the FCRPS Action Agencies to review and modify existing fish population status monitoring projects to improve their compliance with regional standards and protocols, and ensure they are prioritized and effectively focused on critical performance measures and populations. These modifications will be proposed in FY 2009 and implemented in FY 2010.

RPA Action 51 describes in part, that the FCRPS Action Agencies will facilitate and participate in ongoing regional RM&E collaboration processes to develop a regional strategy for status and trend monitoring for key ESA fish populations. Continued state and tribal involvement in these ongoing regional collaboration processes will facilitate the FCRPS Action Agencies modification of existing fish population monitoring projects to improve their compliance with regional standards and protocols, and ensure they are prioritized and effectively focused on critical performance measures and populations.

Comment 6-B *CRITFC and Idaho suggested that sufficient RM&E is needed to determine status and trend for at least one population in each MPG and must be capable of measuring progress toward recovery.*

Response 6-B The effectiveness of the FCRPS action will be demonstrated by achieving life stage specific performance metrics and standards identified in the FCRPS Biological Opinion. Aggregating the effect of achieving those metrics and standards over the entire life cycle at the ESU scale can be used to estimate the status and trend of the ESU. A monitoring program structured around the status and trend for at least one population in each MPG is one of many possible approaches to facilitate the determination of ESU status and trend. The details of the larger Research Monitoring and Evaluation framework that the FCRPS Action Agencies will implement to achieve these objectives per RPA Actions 50 and 51 will be identified, in part, through collaboration in regional RM&E forums as described in the previous comment.

Comment 6-C *CRITFC suggests that the Biological Opinion does not ensure that RM&E and RPA evaluation is reasonably certain to occur.*

Response 6-C The RPA requires RM&E actions that the FCRPS Action Agencies must implement. Evaluation of the effectiveness of the RPA is mandated through Implementation Plans, Annual Progress Reports and Comprehensive RPA Evaluation Reports in 2013 and 2016. NOAA Fisheries assumed in its analysis of the FCRPS action that the Action Agencies would fully implement these non-discretionary actions. NOAA Fisheries will consider deficiencies in implementation of RM&E as a possible reinitiation trigger.

Comment 6-D *CRITC, the Nez Perce Tribe and Washington suggest that regional coordination and collaboration are not adequately defined, nor reasonably certain to occur.*

Response 6-D RPA Actions 51, 52, 55, 57, 64, 71, and 72 require that the FCRPS Action Agencies coordinate and collaborate with Federal, State, and Tribal agencies and other regional groups in RME and data management. The FCRPS Action Agencies retain discretion regarding how to effectively and efficiently implement those coordination and collaboration actions.

Comment 6-E *CRITFC suggests that the FCRPS Biological Opinion has neither a long-term nor sustained monitoring commitment for the lower river.*

Response 6-E The RPA requires that monitoring for this species be commensurate with the effects of the FCRPS. RPA Actions 58 through 61 identify non-discretionary RM&E actions in the estuary and near ocean that will monitor and evaluate fish performance and habitat condition in these areas. The Action Agencies will monitor biological response and/or environmental attributes, selected ecological attributes of the estuary, and the effects of a representative set of habitat projects in the estuary. Information from these monitoring and evaluation actions should inform the FCRPS Action Agencies assessment of the effect of the FCRPS on the lower river.

Comment 6-F *CRITFC and Washington state that the Habitat RM&E does not include effectiveness monitoring studies on some of the most pervasive limiting factors or include a sufficient scope of monitoring elements to monitor action-related changes in survival.*

Response 6-F RPA Actions 50, 56, and 57 include actions to determine the physical and biological effectiveness of individual projects and watershed scale project implementation as well as reliance on published research studies and models to refine our understanding of the relationship between habitat limiting factors, management and restoration actions, and fish survival.

Comment 6-G *CRITFC and Oregon stated that the FCRPS RM&E Framework is insufficient.*

Response 6-G Research and monitoring actions that the FCRPS Action Agencies implement for the FCRPS are of utmost importance because, without sufficient data, it will be impossible to determine whether the RPA performance is as effective as expected. Fish habitat and population monitoring is often conducted to determine if environmental measures, like those included in the proposed action, provide the desired level of protection and enhancement for target fish species and aid in the development of responsive adaptive management strategies. Monitoring is also a necessary tool for providing data critical to adaptive management. Its implementation will ensure that managers have information to determine the effectiveness of the RPA. This monitoring information will also allow adaptive management decisions to be made to ensure the long-term persistence of listed fish species in the Columbia River Basin, as well as the ability to respond to significant changes in environmental conditions.

Under RPA Actions 50 through 73, the FCRPS Action Agencies will monitor and evaluate the effectiveness of various aquatic measures including fish passage compared to performance standards; adult anadromous salmonid migration, spawning, distribution, productivity and abundance; water quality; habitat quality and quantity, especially when involved in habitat restoration/conservation actions; and hatchery supplementation programs. The FCRPS Action Agencies will prepare annual monitoring reports that include the raw monitoring data. The Action Agencies will report progress on implementation through Implementation Plans (RPA Action 1), Annual Progress Reports (RPA Action 2), and Comprehensive Evaluation Reports (RPA Action 3). The Comprehensive Evaluations will also describe the status of the physical and biological factors identified in this RPA, and compare these with the expectations in the survival improvements identified in the Comprehensive Analysis.

Issue 7: Comments on Climate Change Considerations

Comment 7-A *Oregon, CRITFC the Nez Perce Tribe and the Save Our Wild Salmon Coalition recommend a more thorough treatment of climate change in the final document, including explicit treatment of changes in climate affecting freshwater life stages.*

Response 7-A

In response, NOAA Fisheries has:

1. expanded the discussion of climate change in the environmental baseline (Chapter 5);
2. clarified climate change assumptions in quantitative analyses (Chapter 7);
3. determined that it was not possible to definitively quantify future effects on freshwater life stages at this time at a level sufficient to permit meaningful analysis, but added qualitative criteria to evaluate Prospective Actions relative to proactive action recommendations of the ISAB;
4. and explicitly considered climate change in the effects analysis and conclusions.

Please see the Supplemental Comprehensive Analysis as well as the Climate Change Considerations in the Issue Summaries document.

Issue 8: Scope and Effectiveness of Reasonable and Prudent Alternatives

Comment 8-A

The Confederated Tribes of the Colville Reservation suggest mitigation measures between McNary and Bonneville dams: Additional actions are needed to recover the ESUs and DPSs in the mainstem between McNary and Bonneville dams.

Response 8-A

NOAA Fisheries is aware there are differences in conversion rates of Upper Columbia River and Snake River populations. The reasons for these differences are unknown, but could be related to migration timing, aspects of adult passage, harvest, or some combination of these factors. Relevant information can likely be gleaned from existing PIT-tag data, but resolution of the source of the differences will likely require more research. NOAA Fisheries supports efforts to identify the reasons for the problem and appropriate remedies.

Issue 9: Comments on the Approach to the Habitat Analysis

Comment 9-A

Oregon and CRITFC suggest that the qualitative methodology utilized in the FCRPS Biological Opinion needed refinements. Response 9-A provides a general overview of the methodology. Specific comments and responses follow.

Response 9-A

The Remand Collaboration Habitat Workgroup (Habitat Workgroup) was asked by the Remand Collaboration Policy Work Group (PWG) to develop a general standardized methodology which could be used to evaluate the physical and biological benefit of habitat projects to listed anadromous salmonids, within the timeframe provided by the remand. The Habitat Workgroup sought a standardized approach to evaluating biological benefits of habitat projects that could be applied consistently throughout the Basin. A limitation on available methodology is due to the lack of empirical data relating habitat change to survival change for most populations under investigation.

The methodology developed by the Habitat Workgroup is based on linkages between improvements to limiting factors, improvements to habitat quality and fish survival improvements. The developed approach to estimating habitat benefits relies on the following sequence of steps:

1. Identify the primary factors limiting the recovery of salmon and steelhead populations,
2. Identify the tributary habitat actions (or types of actions) that could be implemented to address those limiting factors,
3. Estimate the current habitat function,
4. Estimate the habitat function that could be obtained by 2018 (within 10 years) by implementing all tributary habitat restoration actions that were identified as planned by 2018,
5. Estimate the habitat function that could be obtained by 2018 (within 25 years) by implementing all tributary habitat restoration actions that were identified as planned by 2018, and
6. Convert estimated overall habitat functions to survival estimates.

The FCRPS Biological Opinion habitat evaluation relies on the FCRPS Action Agencies' implementation of the Habitat Workgroup's methodology. That methodology uses a logical path for obtaining estimates of the habitat condition and survival improvement potential from habitat actions. Briefly, the logic path is based on stepping down from individual populations to population-specific limiting factors, from the population-specific limiting factors down to the subarea to the degree that actions implemented to address those limiting factors would improve habitat quality in that subarea. This logic path provided the basis for estimating changes in habitat function for salmon and steelhead populations as a result of implementing habitat actions. Local biologists provided information for steps 1-5, the products of which the Action Agencies use to complete step 6 based on general habitat/survival relationships developed within the Habitat Workgroup.

This approach is based on best available information from local field biologists and recovery planners and general empirical relationships between habitat quality and salmonid survival. Local biologists and recovery planning processes identified, from recovery plans, primary limiting factors and tributary habitat actions needed to address those limiting factors. These biologists then estimated the change in habitat function that would accrue if habitat actions were completed as intended. Professional judgment by expert scientists provided a large part of the determination of habitat function in all locations simply because of the limited extent of readily-available empirical data and information. Although NOAA Fisheries recognizes that empirical data and information provides the best insight for determining habitat functioning and salmonid survival, the extent of readily-available empirical data was not adequate to make a precise determination of habitat function and salmonid response uniformly throughout the Columbia River Basin.

The FCRPS Action Agencies will report in Annual Progress Reports on the status of habitat project implementation per RPA Actions 2, 34, 38, 50, 56 through 59, and 73. These reports will include quantitative descriptions of those physical metrics which will document project implementation and estimate the physical and biological benefits achieved relative to commitments. At the comprehensive reviews in 2013 and 2016, they will report progress toward overall habitat quality improvement targets and population-specific survival benefit. Where population-specific survival benefits are not achieving progress guidelines above, the Action Agencies will identify and accelerate as necessary implementation of processes or projects to ensure that all past and current objectives will be achieved by the next comprehensive report (see RPA Action 35).

NOAA Fisheries concluded that the approach developed, and information gathered, through the Habitat Workgroup and subsequently applied here represents the best available information that consistently can be applied over the larger Columbia Basin to estimate the survival response of salmonids to habitat mitigation actions. Generalized relationships found in peer reviewed publications. Attachment C-1 of the Comprehensive Analysis describes the method used to calculate habitat improvement and resulting egg-smolt survival improvement.

NOAA Fisheries recognizes that standardized approaches to describing relationships between habitat and survival may be constrained by existing data quantity and quality and uncertainty in the region's present understanding of those relationships under the best science currently available. In order to address these issues, and refine our understanding of these relationships over time, NOAA Fisheries has included, in RPA Action 57, a requirement that the Action Agencies will convene a regional technical group to develop an initial set of relationships in FY 2008, then annually convene the group to expand and refine models relating habitat actions to ecosystem function and salmon survival by incorporating research and monitoring results and other relevant information.

Comment 9-B *Oregon and CRITFC suggest that the methodology used in the Biological Opinion overestimates benefits of habitat work in the tributaries and estuary. In particular, they provide several examples of overestimate benefits, with an emphasis on spring Chinook projects.*

Response 9-B These commenters misunderstood the difference between the calculations for all potential actions brought forward from recovery and subbasin plans and the proposed action for the FCRPS Biological Opinion. Habitat tables provided by collaborators to the Habitat Workgroup included the potential habitat change for individual limiting factors obtained by implementing all potential actions brought forward from recovery plans. These habitat change figures, however, represent changes needed for recovery over a longer time period that the RPA. In contrast, the RPA requires a more focused set of actions and commitments for the Action Agencies. Expert panels, assembled with guidance from the Habitat Workgroup, used the habitat tables provided by the collaborators and evaluated calculations for: Current condition, potential or what is possible, and the habitat change attributable to habitat actions implemented solely for the FCRPS Biological Opinion proposed action. The methodology estimates the benefit of the proposed action(s) but does not address whether they are sufficient to achieve long-term recovery.

For the calculations completed for the South Fork Clearwater, South Fork Salmon, Wallowa, and Imnaha Rivers, the Nez Perce Tribal biologists used a weighted effect on survival for each limiting factor rather than the averaging method. The biologists determined that the effect of identified limiting factors could be prioritized and weighted relative to their impact on the population. For example, limiting factor #1 may have twice the effect on the population as limiting factor #2; hence addressing limiting factor #1 could have twice the benefit of a similar effort focused on limiting factor #2. Averaging was used where experts did not have an adequate basis for apportioning priorities among factors.

For the calculations in the Pahsimeroi, the local biologists evaluated the original habitat tables available to the Habitat Workgroup and determined that it is feasible to add flow, fence, screen, etc. to two different assessment units, upper and lower. They determined that completing all improvements in both assessment units would result in 71% improvement in habitat quality. However, the RPA does not require improvement projects in the upper assessment unit but instead identifies a subset of the total feasible actions for implementation in the lower unit. Therefore, the estimated benefit from the proposed actions (41%) is lower than what is achievable if all actions were fully implemented.

In the Lemhi, in the assessment unit that includes the Lemhi River mainstem, Hayden creek, and Big Springs Creek, the local biologists evaluated the original habitat tables and indicated there was potential to increase the limiting factor of instream flows from its current status of 11% of optimum function to 31% of optimum function. However, they estimated that FCRPS Biological Opinion proposed instream flow projects will move this limiting factor from 11% to 15% in this assessment unit. Likewise in the assessment unit that includes seasonally connected and disconnected tributaries, the local biologists estimated that it was possible to increase the streamflow limiting factor to 30% of optimum. However, the proposed projects would only achieve 10% improvement.

Comment 9-C *Oregon, CRITFC, and the Save Our Wild Salmon Coalition suggest that other methods would be more accurate than the habitat methodology used by the Habitat Workgroup.*

Response 9-C Another method mentioned in the comment, developed by Budy and Schaller (2007), was not directly applicable to the FCRPS Biological Opinion. As described in Response 2-Q, Budy and Schaller (2007) described habitat potential to achieve long-term recovery, or delisting from ESA. They concluded that recovery is not achievable by tributary habitat improvement along. However, the Biological Opinion evaluates whether the Prospective Actions, when properly added to other ESA considerations, avoids jeopardy and puts the listed fish on a trend to recovery. The difference in the two standards is significant, as described in Response 2-Q. In addition, consistent with Budy and Schaller's conclusion, the FCRPS Biological Opinion builds on a comprehensive strategy across the life-cycle of salmon and steelhead and does not rely on a single "H" to achieve its biological goals.

In particular for habitat methodology, Budy and Schaller (2007) described a "Best Case" scenario that assumes all habitat problems are corrected immediately. The Habitat Workgroup's approach recognizes that habitat improvement takes time to complete and in many cases even more time to realize a benefit. The methodology developed by the Habitat Workgroup is conservative. Results typically showed less improvement potential than other estimates. For example, the Habitat Workgroup method estimated that a 75% improvement was possible for Lemhi River Chinook from habitat actions.

It is important to point out that the habitat method described in the SCA incorporates habitat-survival relationships that are similar to those used in the McHugh et al. (2004) method, which is the underpinning of the Budy and Schaller (2007) paper. Additionally, the SCA habitat method used habitat-survival relationships from other published sources. The McHugh et al. (2004) method only considers habitat factors that affect temperature and substrate—it does not consider the effects of channel complexity, off-channel rearing, or low flow on survival as the SCA habitat analysis does. NOAA Fisheries has identified flows as a limiting factor for nine of the SR spring/summer Chinook populations, so the Budy and Schaller (2007) paper may under estimate tributary habitat improvement potential for these populations.

The Budy and Schaller (2007) analysis was only conducted for nine populations. The method of extending the results to other populations is reasonable for a very general approximation, but the specific numerical results rely on the unrealistic assumption that all populations in a particular category have both the same initial habitat conditions and will have identical survival responses to habitat changes. Also, four of the nine populations are from relatively pristine areas with an obvious lack of potential for habitat improvement. It is not clear if this unduly influences their overall ESU results.

Comment 9-D *CRITFC and the Save Our Wild Salmon Coalition suggest that the relationship between habitat improvements and survival improvements was not adequately developed.*

Response 9-D NOAA Fisheries concluded that the approach developed, and information gathered, through the Habitat Workgroup and subsequently applied here represents the best available information that consistently can be applied over the larger Columbia Basin to estimate the survival response of salmonids to habitat mitigation actions. Generalized habitat-stage specific survival relationships were developed using empirical relationships found in peer reviewed publications. Attachment C-1 of the Comprehensive Analysis describes the method used to calculate habitat improvement and resulting egg-smolt survival improvement.

Like any other modeling exercise, the method used by the Habitat Workgroup involved certain assumptions. The Habitat Workgroup looked at available empirically-based peer-reviewed relationships between habitat quality and survival (fine sediment, temperature_ and other models to determine the "shape" of the relationship (i.e., linear or non-linear). After reviewing and plotting the various relationships from other models, the Habitat Workgroup decided to use a linear relationship as the most realistic method to guide the professional judgment of local biologists (see Attachment C-1 of the Comprehensive Analysis for further explanation of the methodology). In order to reflect empirically observed egg-smolt survival rates (e.g., egg-smolt survival does not naturally range from 0-100%) the Habitat Workgroup "capped" survival, based on the literature, at 18% and 4% for Chinook and steelhead egg-smolt survival, respectively, and 35% egg-fry survival for chum salmon.

NOAA Fisheries recognizes that the estimates of benefit achieved using the Habitat Approach can be not better than our current understanding of the relationships upon which the Habitat Approach is based. Estimates developed from any approach will be refined and improved as more information becomes available and is applied. As a result, NOAA Fisheries has included, in RPA Action 57, a requirement that the Action Agencies will convene a regional technical group to develop an initial set of relationships in FY 2008, then annually convene the group to expand and refine models relating habitat actions to ecosystem function and salmon survival by incorporating research and monitoring results and other relevant information.

Issue 10: Comments On The Approach To Selecting Habitat Projects

Comment 10-A *CRITFC suggests that the Biological Opinion fails to ensure that the Action Agencies make specific and binding funding commitments to specific habitat actions for 2008-2017. They propose that the FCRPS BiOp specify funding and locations for habitat actions to ensure that an adequate number of projects are completed.*

Response 10-A The FCRPS Action Agencies have committed to implementing specific tributary actions in FY07-09 (See BA, Appendix B2.2-2). Although the agencies do not specify detailed projects in FY2010-2018, the RPA requires they achieve population-specific survival improvements through changes in habitat quality over the duration of this BiOp (see Table 5, RPA actions). NOAA Fisheries based its analysis of effects of the Prospective Action on the expectation that these population-specific survival improvement commitments would be achieved.

The Biological Opinion identifies the process by which these future actions will be identified and evaluated relative to those survival commitments. There are different combinations of projects that result in the required habitat improvement. There are different combinations of actions which could be implemented to achieve the Action Agency survival commitments. The Biological Opinion identifies the process by which future actions will be identified and evaluated relative to their individual and collective contribution to achieve population-specific survival commitments (RPA Action 35).

Comment 10-B *CRITFC suggests that selecting or evaluating replacement projects should be utilizing the same methodology.*

Response 10-B RPA Action 35 requires that a group of experts review and analyze substitute projects according to the same methodology as the initial review. Projects would be evaluated by their impact on key limiting factors and the intrinsic potential of the treated area.

Comment 10-C *CRITFC suggests that additional habitat actions for Clearwater and Salmon River B-run steelhead are needed.*

Response 10-C Based on the FCRPS analytical process, the RPA requires the Action Agencies to improve survival for these populations such that, in conjunction with action in the other "Hs," they demonstrate a trend toward recovery.

Comment 10-D *CRITFC suggests that the Prospective Actions and associated benefits are hard to track, unrealistic, and double counted in some instances.*

Response 10-D The FCRPS Biological Opinion specifies the survival improvements to be achieved through habitat quality improvement projects implemented within the ten-year period of the Biological Opinion (see Table 5 in RPA). The FCRPS Action Agencies will select and fund projects to achieve those survival improvement standards in coordination with existing regional project planning, identification, prioritization and scientific review processes. For example, Bonneville Power Administration will utilize the Northwest Power and Conservation Council's (NWPCC) process for selection of projects. During the 2007-2009 time period, projects to be implemented have undergone review by the Independent Scientific Review Panel (ISRP) which considers the efficacy of proposals in its review as part of the NWPCC process. Projects to be implemented in FY 2010–2018 will be proposed by local experts with respect to addressing limiting factors identified in Recovery Plans and ability to achieve habitat and survival improvements. These projects will also receive scientific review by the ISRP.

Comment 10-E *CRITFC suggests that the FCRPS BiOp should provide more specificity about which projects will be funded and where the projects will occur. Commenters suggest that the FCRPS BiOp evaluate the sufficiency of the FCRPS Action Agencies funding commitments.*

Response 10-E The FCRPS Biological Opinion establishes survival improvement commitments for focal populations (see RPA Table 5). The Action Agencies are responsible for achieving those biological survival improvements, not for spending a specified amount of money. NOAA Fisheries based its assessment on the habitat program on achievement of those survival commitments, not on the Action Agencies estimates of current or future funding amounts or how funds will be distributed. RPA Action 35 will validate whether the required survival improvements were actually achieved.

Comment 10-F *CRITFC emphasizes the need to have a sufficient backlog of projects on the shelf if replacements are needed.*

Response 10-F NOAA Fisheries agrees that having replacements projects identified would minimize any break in implementation should replacement projects be necessary. Lists of tributary habitat actions brought forward from recovery and subbasin plans were provided by collaborators through the Remand Collaboration Habitat Workgroup. These actions constitute an expansive list of potential projects that could receive appropriate review if replacement projects are needed.

Issue 11: Comments On Jeopardy Analysis For Hatchery Programs Funded By The Action Agencies

Comment 11-A *The Save Our Wild Salmon Coalition, Idaho Rivers United, and the Native Fish Society questioned how ESA consultations will be completed for the operation of hatchery programs funded by the FCRPS Action Agencies.*

Response 11-A Hatchery programs have been funded to compensate for effects of the FCRPS. The action of funding hatchery compensation is covered under this Biological Opinion because hatchery effects, together with other effects, are imbedded in the environmental baseline and are carried forward prospectively and because the FCRPS Proposed Action includes the continuation of funding pending the implementation of hatchery reforms. The action of operating hatchery programs funded by the Action Agencies is not covered under this Biological Opinion because the operations and effects of these programs are unspecified in the PA and in the Action Agencies' August 2007 Comprehensive Analysis (CA). RPA Action 39 requires new Hatchery and Genetic Management Plans (HGMP) including a proposed action and effects analysis for every hatchery program and specifies a schedule for completing hatchery-specific ESA consultations.

Issue 12: Comments on the Approach to the Hatchery Effects Analysis

Comment 12-A *The Native Fish Society questioned how hatchery programs can slow the decline of ESA-listed salmonids.*

Response 12-A The key to slowing the decline and recovering ESA-listed salmon and steelhead is addressing the factors that limit their survival. Hatchery programs can buy time until the factors limiting salmon and steelhead survival are addressed. Hatchery programs are not a substitute for implementing actions to address limiting factors. Hatchery programs can reduce short-term extinction risk by preserving genetic resources. Genetic resources can reside in hatchery fish and NOAA Fisheries' listing decisions determine which hatchery programs are included in a salmon ESU or steelhead DPS. As limiting factors are addressed and survival improves, the dependence on hatcheries to conserve genetic resources should decline.

Issue 13: Comments On Implementing Hatchery Reform

Comment 13-A *Oregon, the Save Our Wild Salmon Coalition, the Public Power Council, and the Native Fish Society expressed uncertainty over what kinds of hatchery reforms are expected and over the process and schedule for implementing hatchery reforms.*

Response 13-A Section 5 of the SCA Appendix C (Artificial Propagation for Pacific Salmon Appendix: Assessing Benefits and Risks & Recommendations for Operating Hatchery Programs Consistent with Conservation and Sustainable Fisheries Mandates) provides a useful summary of progress in hatchery reform. Continued hatchery reforms leading to improved salmon and steelhead survival are also included in the FCRPS Proposed Action and in the NOAA Fisheries Biological Opinion. Guidance for hatchery reform is provided in SCA Appendix C. RPA Action 39 requires new Hatchery and Genetic Management Plans (HGMP), including a proposed action and effects analysis, for more than one hundred hatchery program and specifies a schedule for completing hatchery-specific ESA consultations and implementing hatchery reforms.

Issue 14: Comments on Hatchery Reforms that Reduce Risks to Population Viability

Comment 14-A *The Native Fish Society claims that the Hatchery Effects Report is incorrect because it implies that hatchery reforms make hatchery and natural-origin fish identical.*

Response 14-A Available science cited in the Hatchery Effects Report (SCA Appendix D: Hatchery Effects Appendix) and the Biological Opinion show that the relative fitness or effectiveness of hatchery-origin fish is reduced relative to natural-origin fish. It also shows that broodstock practices can increase the relative fitness of hatchery-origin fish in the wild and that different hatchery reforms, including reduced hatchery fish straying, controls over the proportion of natural spawners comprised of hatchery-origin fish, and the duration of hatchery supplementation can reduce risks to population viability. The Biological Opinion and jeopardy analysis includes base-to-current survival adjustments resulting from hatchery reform actions in the Grande Ronde system for Snake River spring/summer Chinook and for reform actions effecting the Wenatchee and Entiat steelhead populations. Survival increases are calculated based on reductions in the proportion of natural spawners comprised of hatchery-origin fish (e.g., Entiat steelhead) and hatchery broodstock practices that increase the reproductive fitness of naturally spawning hatchery-origin fish (e.g., Wenatchee steelhead and Chinook populations in the Grande Ronde). Survival adjustment factors are based on the latest scientific studies and these studies are cited in Section 7.2.4 of the Supplemental Comprehensive Analysis.

Issue 15: Comments on the New Harvest Regimes from *U.S. v Oregon*

Comment 15-A *CRITFC suggests specific language for the FCRPS Biological Opinion regarding harvest on Group B steelhead in Zone 6. The suggested language presumes that the new Columbia River Fisheries Management Plan, which permits a 15 percent harvest rate in Zone 6 fisheries, will be part of the environmental baseline in the final FCRPS Biological Opinion.*

Response 15-A The change in the allowable harvest rate in Zone 6 for B-run steelhead was not reflected in the October 2007 draft Biological Opinion because details related to those provisions were not fully resolved at the time. However, the abundance based harvest rate schedule for B-run steelhead contained in the 2008 U.S. v. Oregon Agreement is included and accounted for in the final biological opinions on harvest and the other prospective actions as shown, for example, in Section 8.5 of the Harvest Biological Opinion and the SCA.

Comment 15-B *CRITFC suggests that NOAA Fisheries should include a steelhead harvest rate schedule that is consistent with the tentative agreement.*

Response 15-B The abundance based harvest rate schedule for B steelhead contained in the U.S. v. Oregon Agreement is included and accounted for in the final biological opinions on harvest and the other Prospective Actions as shown, for example, in Section 8.5 of the Harvest Biological Opinion and the SCA.

Comment 15-C *CRITFC suggests that there is additional Treaty and non-treaty harvest in the Grande Ronde, Imnaha, Lower Salmon, and the South Fork Salmon rivers that has not been accounted for in the Biological Opinion.*

Response 15-C Harvest in these tributaries is managed by the relevant state and tribal parties independently and outside the bounds of the U.S. v. Oregon Agreement and other Prospective Actions. Fisheries in these areas are localized near hatchery production facilities and target returning hatchery origin fish, but rely on abundance based harvest schedules that limit impacts to natural-origin fish that return to or pass through the area. The harvest schedules are quite restrictive when returns are low and allow higher harvest rates only when abundances approach or exceed recovery based abundance criteria. Harvest in these areas has occurred in recent decades, but has been variable depending on year specific circumstances. Harvest in these areas has not been explicitly accounted for in the comprehensive analysis, but are implicitly part of the base condition. ESA related consideration of these fisheries has generally been done on an annual or short-term basis. Consideration of these fisheries as part of the future condition is therefore hampered by lack of a long term management plan that could be considered as part of the baseline. NOAA Fisheries expects these fisheries will occur as they have in recent years. However, the magnitude of these fisheries will be variable depending on year specific circumstances. As a practical matter it would be difficult to incorporate these fisheries into the quantitative comprehensive analysis that relies, for the most part, on fixed changes in survival rates for a particular action. These fisheries will be subject to ESA related review in the future and will have to take into account the environmental baseline that will include all of the Prospective Actions.

Comment 15-D *CRITFC expresses concern about the accuracy and applicability of using the abundance methodology*

Response 15-D NOAA Fisheries uses the best available information to estimate harvest impacts on SR steelhead. NOAA Fisheries acknowledges the concern and possible shortcomings of some of the assumptions used for measuring harvest impacts on steelhead. RPA Action 62 is specifically designed to help elucidate differential survival rates of adult steelhead during upstream migration which will contribute to our understanding of harvest mortality. The Action Agencies, through RPA Action 62, will evaluate the use of PIT-tags or other methods to improve estimates of harvest impacts. RPA Action 71 will also assist with development and implementation of improved harvest related monitoring programs.

Comment 15-E *CRITFC expresses concern as to whether the average harvest values, applied to the lower Snake River MPG, adequately reflect the impacts to each population.*

Response 15-E NOAA Fisheries uses the best available information to estimate harvest impacts to Snake River steelhead including that of the lower Snake River MPG. NOAA Fisheries acknowledges the concern and possible shortcomings of some of the assumptions used for measuring harvest impacts to steelhead. RPA Action 62 is specifically designed to help elucidate differential survival rates of adult steelhead during upstream migration which will contribute to our understanding of harvest mortality. The Action Agencies, through RPA Action 62, will evaluate the use of PIT-tags or other methods to improve estimates of harvest impacts. RPA Action 71 will also assist with development and implementation of improved harvest related monitoring programs.

Comment 15-F *CRITFC suggests that different groups of steelhead are almost certainly subject to different harvest rates and the averaging of harvest rates results in questionable estimated impacts on certain distinct population segments.*

Response 15-F NOAA Fisheries uses the best available information to estimate harvest impacts on SR steelhead. NOAA Fisheries acknowledges the concern and possible shortcomings of some of the assumptions used for measuring harvest impacts on steelhead. RPA Action 62 is specifically designed to help elucidate differential survival rates of adult steelhead during upstream migration which will contribute to our understanding of harvest mortality. The Action Agencies through RPA Action 62 will evaluate the use of PIT-tags or other methods to improve estimates of harvest impacts. RPA Action 71 will also assist with development and implementation of improved harvest related monitoring programs.

Comment 15-G *CRITFC states that the maximum harvest rate on Snake River steelhead, per U.S. v. Oregon, needs to be accurately reflected in the final Biological Opinion.*

Response 15-G The abundance based harvest rate schedule for B steelhead and other provisions related to steelhead contained in the *U.S. v. Oregon* Agreement are included and accounted for in the final biological opinions on harvest and the other Prospective Actions as shown, for example, in Section 8.5 of the Harvest Biological Opinion and the SCA.

Comment 15-H *CRITFC expresses concern as to whether the draft FCRPS Biological Opinion is correct in its statement about the maximum harvest rate on Snake River steelhead given changes that have taken place in the U.S. v. Oregon agreement.*

Response 15-H NOAA Fisheries contends that a more accurate statement is that non-treaty fisheries in the lower Columbia River are limited to a harvest rate of 2 percent on Upper Columbia River and Snake River spring Chinook. The harvest rate limit does not apply specifically to Lower Columbia River spring Chinook.

Comment 15-I *CRITFC suggests that clarification is needed in regard to the total allowed ocean and in-river exploitation rate on lower river tules, as it was reduced from 65 to 42 percent and the lower river bright populations are managed for a Lewis River escapement goal.*

Response 15-I Harvest impacts on LCR Chinook explicitly are considered as part of the review of the U.S. v. Oregon Agreement and other Prospective Actions. See for example, the discussion in Section 8.10 of the Harvest Biological Opinion. LCR tule Chinook are subject in 2008 to a total exploitation rate limit of 41% for all ocean and in-river fisheries. After 2008, and for the duration of the U.S. v .Oregon Agreement, ocean and in-river fisheries will be subject to a similar total exploitation rate constraint that will be defined by NOAA Fisheries through its annual Guidance to the Pacific Fisheries Management Council. Impacts to LCR bright populations are limited in ocean and in-river fisheries to a large degree by constraints on other ESA listed species and populations including Snake River fall Chinook, tule Chinook, coho and steelhead. The Harvest Biological Opinion indicates the intent to continue to rely on the escapement goal for Lewis River brights as the primary management indicator (see Section 8.10 of the Harvest Biological Opinion).

Comment 15-J *CRITFC suggests that applying one harvest rate to all PIT-tagged steelhead will produce a possibly significant level of uncertainty in the results; cited is the difference between wild and hatchery harvest rates.*

Response 15-J PIT-tag data is not currently used for estimating steelhead harvest rates. Through RPA 62 the Action Agencies will evaluate whether sampling for PIT-tags in the fishery can help improve harvest estimates. NOAA Fisheries is aware of the need to be careful when using PIT-tags for various purposes including the need to distinguish between hatchery and natural-origin fish.

Comment 15-K *CRITFC suggests that recreational fisheries for spring Chinook are all mark-selective so total harvest rate estimates will overestimate impacts on non-clipped spring Chinook.*

Response 15-K NOAA Fisheries is aware of recent information developed through consultation on the prospective actions of information from PIT-tags that indicates differential survival rates for adult fish returning to the upper Columbia River and Snake Rivers during upstream migration. These differences were highlighted through comments received for the draft FCRPS Biological Opinion. There is insufficient information at this time to sort out the causes of these differential survival rates, but consideration of these results is identified as a priority for future evaluation and research. The issue is highlighted, for example, in Section 8.5 of the Harvest Biological Opinion as it relates to steelhead. NOAA Fisheries has also incorporated RPA language into the FCRPS Biological Opinion that is specifically designed to address this question.

Mark selective fisheries result in differential impacts to hatchery and natural-origin fish. In fact, the purpose of mark selective fisheries is to provide access to harvestable hatchery fish while limiting impacts to natural-origin fish. Most non-treaty fisheries for spring Chinook and steelhead are mark selective. ESA related harvest limits for non-Treaty fisheries are defined in terms of harvest rates to natural-origin fish. This can be seen, for example, in Section 8.5 for Snake River steelhead and Section 8.3 for Snake River spring/summer Chinook in the harvest Biological Opinion. Harvest impacts to hatchery and natural origin fish are monitored and reported separately.

Comment 15-L *CRITFC suggests that the abundance-based harvest rate schedule has value because they reduce harvest levels when stocks are at lower levels.*

Response 15-L An abundance based harvest rate schedule will be used for managing upriver spring Chinook as reflected in the Harvest Biological Opinion (see, for example, Section 8.3 on Snake River spring/summer Chinook).

Issue 16: Comments on the Role of Funding Selective Harvest Research, Monitoring & Evaluation

Comment 16-A *Oregon suggests that the draft FCRPS Biological Opinion does not provide sufficient funding for selective harvest investigations. This is particularly pertinent to Snake River fall Chinook harvest.*

Response 16-A The FCRPS Action Agencies through RPA Action 62 will provide funding for development of selective fishing methods and gear, and post release mortality rates.

Issue 17: Comments on Measuring Conservation Progress Accrued From Changes in Harvest Regimes

Comment 17-A *Washington expresses a concern about NOAA Fisheries' ability to reliably estimate the conservation progress accrued from changes to harvest regimes without providing a stronger commitment to funding basic annual abundance monitoring that would form the baseline in the FCRPS Biological Opinion.*

Response 17-A RPA Actions 71 and 72 are designed to improve the coordination of RM&E efforts and related data management for harvest and other sectors that affect listed species. If there is "conservation progress" in the form of improved species status it may be difficult to attribute improvement to harvest or any other particular set of actions. Nonetheless, the RM&E effort will improve our ability toward achieving conservation progress in the form of improved species status.

Comment 17-B *Washington commented that in order to document the expected conservation value from abundance-based harvest, there must be greater certainty about harvest interception rates.*

Response 17-B The Harvest Biological Opinion includes reasonable and prudent measures that require careful monitoring of the fisheries using best available information. There are ongoing efforts designed to improve measures of harvest impact. For example, recent PIT-tag analysis indicates that there is a difference in survival rates of upper Columbia River and Snake River steelhead as they migrate upstream. The difference may be related to harvest or other factors, but this is identified as an issue that needs to be reviewed (see, for example, discussion in Section 8.7 on UCR steelhead in the Harvest Biological Opinion.

Comment 17-C *Washington commented that the current BPA funded harvest sampling and monitoring must be maintained and more support given to projects and methods to increase knowledge and reduce uncertainty. These improvements could include PIT-tag sampling technology and genetic stock identification methods.*

Response 17-C Through RPA Action 62 the Action Agencies will fund further investigations related to the use of PIT-tags and GSI techniques to improve harvest monitoring. The Action Agencies are also committed, through RPA Actions 71 and 72, to improve the coordination and management of RM&E efforts including those related to harvest.

Issue 18: Comment on Snake River Fall Chinook

Comment 18-A *CRITFC comments that the opportunities for recovering Snake River fall Chinook through an All-H approach are limited because spawning habitat has been reduced to about 20% of the historical amount.*

Response 18-A Snake River fall Chinook spawned historically in the Snake River above and below the Hells Canyon complex and in the lower mainstems of the Clearwater, Grande Ronde, Salmon, Imnaha, and Tucannon river systems. At least some of these tributaries probably supported significant production, but at much lower levels than in the mainstem Snake River. Some spawning currently occurs in all these areas below Hells Canyon Dam. The Clearwater, Grande Ronde, Salmon, and Imnaha collectively supported a maximum of 852 redds in 2004 (and have averaged at least 500 each year since 2002; see Section 8.2.3.3). The peak redd count in the mainstem Hells Canyon was 1,709 in 2004 (with more than 1,000 each year from 2002 through 2006). Thus, assuming two fish per redd, the available area has demonstrated the capacity to support 5,000 spawners under current conditions and will do so under the Prospective Actions. The ICTRT has set a recovery abundance threshold of 3,000 spawners (i.e., to meet viability goals for abundance at <5% risk of extinction).

Issue 19: Comments on Snake River Sockeye

Comment 19-A *The Save Our Wild Salmon Coalition comment that the sockeye captive broodstock program should be phased out over time due to lack of fitness.*

Response 19-A A number of parties, including NOAA Fisheries have expressed concerns that, because Snake River sockeye reached such low numbers before intervention, genetic bottlenecks will impede recovery. However, recent unpublished data from geneticists for the Stanley Basin Sockeye Technical Oversight Committee indicates that the captive broodstock has similar levels of haplotype diversity as other sockeye populations in the Pacific Northwest (see SCA Section 8.4.2.1). The program reduces the risk of domestication by its spread-the-risk strategy, outplanting prespawning adults and fertilized, eyed eggs as well as juveniles raised in the hatchery. The progeny of adults that spawn in the lakes and juveniles that hatch successfully from the eyed eggs are likely to have adapted to the lake environment.

Comment 19-B T*he Save Our Wild Salmon Coalition and American Rivers comments that the captive broodstock program will only succeed if factors for decline, specifically the FCRPS, are addressed.*

Response 19-B NOAA Fisheries agrees that without substantive improvements in smolt-to-adult survival, even the expanded smolt release program is unlikely to rebuild the ESU to self-sustaining levels. Factors limiting the survival of Snake River sockeye include survival through the mainstem Salmon River as well as the hydrosystem. As described in Section 8.4.2.1 (Habitat) of the SCA, large portions of the migration corridor in the Salmon River are water quality limited for temperature, which is likely to reduced the survival of adult sockeye returning to the Stanley Basin in late July and August. Researchers have observed a high loss of adults in the migratory corridor between Lower Granite Dam and the Stanley Basin. The RPA (Hatchery Strategy 2, Action 42) therefore requires the Action Agencies to work with appropriate parties to investigate the feasibility and potentially develop a plan for ground transport of adult sockeye from Lower Granite Dam to the Stanley Basin.

With respect to changes in the FCRPS, at this time there is little route-specific information on the mortality of juvenile Snake River sockeye except that they appear to be relatively susceptible to descaling. The RPA (RME Strategy 2, Action 52) therefore requires that the Action Agencies assess the feasibility of PIT-tagging juvenile Snake River sockeye for specific survival tracking from the Stanley Basin to Lower Granite Dam and through the FCRPS. The expanded smolt release program is expected to increase the potential number of subjects for this type of study. In the meantime, NOAA Fisheries expects the survival of juvenile sockeye to improve with the implementation of surface passage routes at Little Goose, Lower Monumental, McNary, and John Day dams in concert with training spill to provide safe egress (i.e., reduce delay and vulnerability to predators) (see Section 8.4.5.1 of the SCA).

Comment 19-C *The Colville Tribe's comment that NOAA Fisheries should initiate a satellite broodstock program at a hatchery below Bonneville Dam.*

Response 19-C The Stanley Basin Technical Oversight Committee (SBTOC) has in the past discussed the idea of establishing a satellite population in the lower Columbia River. They have rejected this idea primarily because of concern that a large-scale offsite effort would disrupt the evolutionary adaptations required for the 900+ mile migration up the Columbia, Snake, and Salmon Rivers to the Stanley Basin.

Comment 19-D *The Shoshone-Bannock Tribe's comment that the RPA should require a combination of eyed-egg, adult releases for volitional spawning, and fry and parr releases into lake rearing habitat in concert with increased smolt releases.*

Response 19-D NOAA Fisheries has revised RPA Hatchery Strategy 2, Action 41, adding the text underlined below: "Continue to fund the safety net program to achieve the interim goal of annual releases of 150,000 *smolts while also continuing to implement other release strategies in nursery lakes such as fry and parr releases, eyed-egg incubation boxes, and adult releases for volitional spawning."* RPA Action 42 requires the further expansion of the program to 500,000 to 1 million fish, but the project will continue to implement the "other release strategies."

Comment 19-E *The Save Our Wild Salmon Coalition comment that the loss of marine-derived nutrients from anadromous salmon carcasses is a key factor limiting the productivity of Sawtooth Valley lakes (citing Selbie et al. 2007).*

Response 19-E Based on a study of sediment cores from Redfish Lake, Selbie et al. (2007) concluded that "salmon-derived nutrients [SDN] never contributed substantially to the nutrient dynamics and primary production of Redfish Lake." Although the supply of SDN declined precipitously beginning in the mid-1800s, the authors found evidence that the lake was becoming nutrient enriched in the late 20th Century, "a trend contrary to that expected, given declining salmon escapement and a further reduction in SDN influxes." Whether or not the reduction in SDN is a key factor limiting the recovery of Snake River sockeye salmon, there is evidence that recent nutrient supplementation efforts have successfully increased the productivity of these naturally oligotrophic systems.

Issue 20: Comments Calling for Breaching Dams on The Lower Snake River

Comment 20-A *The Save Our Wild Salmon Coalition and the Nez Perce Tribe suggest that to avoid jeopardy and adverse modification of critical habitats, NOAA Fisheries should issue a reasonable and prudent alternative (RPA) for the FCRPS that features removal of the four lower Snake River dams.*

Response 20-A NOAA Fisheries did not include lower Snake River dam breaching in its reasonable and prudent alternative for the FCRPS and did not conclude that this action or other actions beyond those in the RPA were necessary to avoid jeopardy and adverse modification of critical habitat. The RPA covers hydro system configuration and operations, juvenile transportation, tributary and estuary habitat restoration, hatchery improvements, and an expanded research, monitoring, and evaluation program to guide future actions. In addition, NOAA Fisheries has included in the 2008 RPA only measures actions that are within the authority of the Action Agencies and that are reasonably certain to occur. Dam breaching does not meet that standard.

Only four of 13 listed salmon and steelhead migrate past the Snake River dams, and dam removal would have virtually no effect on nine of the ESUs. Twelve ESUs have seen significant improvement in terms of annual adult returns since 2000 under recent management actions. The most improved is wild Snake River fall Chinook.

In the 2000 FCRPS Biological Opinion, NOAA Fisheries considered the likely effects of dam removal on ESU health. NOAA Fisheries found that the effects of Snake River dam breaching on the four affected species depended almost entirely on assumptions about delayed, or latent, mortality of in-river migrants that is expressed below Bonneville Dam. If that mortality is relatively low, or if it is not eliminated by breaching four of the eight mainstem dams encountered by those species, then breaching resulted in little or no benefit compared to operations under the 2000 FCRPS Biological Opinion's RPA. On the other hand, if post-Bonneville mortality caused by hydrosystem passage is high and dam removal eliminates most or all of it, the potential benefits of dam breaching would be significant. The magnitude of latent mortality remains unknown, as evidenced by the ISAB's (2007b) recent review of available evidence. They concluded that "the hydrosystem causes some fish to experience latent mortality, but [the ISAB] strongly advises against continuing to try to measure absolute latent mortality. Latent mortality relative to a damless reference is not measurable. Instead, the focus should be on the total mortality of in-river migrants and transported fish, which is the critical issue for recovery of listed salmonids." The RPA includes RM&E actions to monitor total mortality (smolt-to-adult returns) and includes hydro actions.

A seven-year study by the Corps of Engineers reached a similar conclusion about dam breaching in 2002. The Corps' independent, peer-reviewed study said dam breaching by itself would not recover the fish and would take more than twenty years to deliver benefits than would other alternatives studied Instead, the Corps recommended major improvements to fish passage at the dams. The RPA includes numerous dam improvements consistent with this recommendation.
Since 2000, there have been significant improvements that should translate to increases in survival across the salmon life cycle, including:

- The Corps has installed removable spillway weirs (RSW) at Lower Granite, Ice Harbor, and recently at Lower Monumental dams on the Snake River. These RSWs have proved to be effective at passing juvenile fish, reducing fish delays upstream of the dams, and, most importantly, increasing survival for these fish without breaching.
- To benefit a broader group of listed fish (Upper Columbia and Mid-Columbia) a similar approach for improved survival is being taken at lower Columbia River dams.
- New turbine technologies are being tested at Ice Harbor dam that will increase turbine survival for juvenile fish.
- As a result of these structural improvements and hydro operations for fish passage, in 2006 and 2007, the NOAA Science Center found that juvenile spring Chinook survival through the eight federal dams on the Columbia and Snake Rivers was the highest yet measured. Juvenile fish survival today is higher than was estimated in the 1960s when there were only four dams in place.
- Extensive habitat improvements have been funded and implemented by the FCRPS Action Agencies, with additional survival benefits for listed fish.

Also, under the ESA, the action is necessarily limited to operating the FCRPS consistently with authorized project purposes. Currently, none of the responsible Federal agencies has Congressional authority to significantly alter the Snake River dams. Therefore, absent new Congressional action, it is not possible that such an action would be reasonably certain to occur or otherwise meet ESA standards for inclusion in the FCRPS Biological Opinion.

Adverse environmental effects from dam breaching are also an important consideration. Water quality for all downstream species would be negatively impacted by movement of sediment following dam breaching. An estimated 100-150 million cubic yards of impounded sediments have accumulated upstream of the Snake River dams. The Corps' Lower Snake River Feasibility Study estimated approximately one-half of this material would migrate downstream and end up in the McNary reservoir. The biological implications of the sediment movement are uncertain but would likely result in high turbidity loads for 5-7 years following breaching (Corps 2002).

In addition to water quality and other effects (Corps 2002), these include the air quality implications of replacement power resources (NPCC 2007), moving backwards rather than forwards in regional goals to decrease carbon emissions (NPCC 2007), and loss of ability of integrate other renewable resources into the regional power grid (BPA 2007). Considering the potential for climate change, these environmental considerations also argue against pursuing Snake River dam breaching.

The 2008 FCRPS Biological Opinion supports a comprehensive, All-H strategy including continued fish passage improvements at the Snake River dams such as surface collection and bypass improvements, as well as offsite actions including habitat and hatchery improvements, to meet the needs for listed fish. This approach benefits not only Snake River fish, but also Upper Columbia and Mid-Columbia salmon and steelhead. For further detail please see Issue Summary: "Why the 2008 FCRPS Biological Opinion Does Not Include Removal of the Four Lower Snake River Dams."

Issue 21: Comments of the adaptive management process

Comment 21-A *CRITFC and the Nez Perce Tribe suggest that NOAA Fisheries should set up a formal decision-making structure in consultation with tribal, state, and federal fisheries managers for adaptive management. The FCRPS adaptive management plan should identify actual contingency measures that can and will be implemented if the Action Agencies fail to meet performance standards. CRITFC, the Nez Perce Tribe, the Regional Coalition, the Spokane Tribe, the Kootenai Tribes, the Colville Tribes, Washington and Montana state that adaptive management must be robust.*

Response 21-A The FCRPS Biological Opinion's RPA includes a strong monitoring program to assess whether implementation is on track and to signal potential problems early. Specific contingent actions are identified within an adaptive management framework for important actions, such as hydro project improvements (e.g., RPA Actions 19 through 25, which identify Phase II actions that will be implemented if Phase I actions do not achieve goals), and tributary and estuary habitat actions (e.g., RPA Actions 34 through 37, which require additional projects in the subsequent 3-year funding cycle if projects prove infeasible). Additionally, the RPA includes implementation planning, annual reporting, and comprehensive evaluations to provide any needed adjustments within the ten-year FCRPS Biological Opinion time frame.

The FCRPS Action Agencies included additional details regarding goals and processes for adaptive management in their August 2007 Biological Assessment. The agencies have developed a comprehensive and detailed plan, with performance measures and targets in all areas where actions are proposed and a process to implement adaptive management that includes coordination with states and tribes. NOAA Fisheries contends that the Action Agencies have sufficiently described and are committed to an ongoing process of adaptive management and accountability. Highlights of the agencies' adaptive management process, some of which are also required by the RPA, are described below.

The FRCPS Action Agencies committed to specific performance targets for the hydrosystem in terms of adult survival (i.e., 90 to 94 percent for Snake River ESUs from Bonneville to Lower Granite; 92 percent for Upper Columbia spring Chinook) and juvenile passage survival (i.e., 96 percent for spring and 93 percent for summer migrants). In addition, the agencies have included performance targets for predation management (survival improvements of 3.1 percent for Chinook salmon, 4.4 percent for steelhead, and 1.7 percent for fall Chinook salmon). The agencies take a different approach to targets for habitat, estimating survival and productivity benefits based on habitat improvement projects identified for implementation in 2007 to 2009. The agencies acknowledge they would prefer a more precise approach but have set out a clear path for developing performance standards for subsequent cycles. For hatcheries, the agencies commit to using performance standards that track implementation of actions within five specific hatchery objectives.

The FCRPS Action Agencies have described a system of performance reports, beginning with submission of implementation plans in 2009, 2013, and 2016. They have committed to annual progress reports and a comprehensive evaluation of multiyear implementation activities in 2013 and 2016. The agencies have also committed to explore contingencies for the FCRPS in advance of knowing whether they will need to be deployed, including dam modifications, alternatives to the current expansion program for Snake River Sockeye safety-net production, and prompt replacement of habitat projects that fail to be implemented.

The commitments in this section of the plan also augment RPA actions to address climate change. For example, the implementation plans will take into account new information on climate change and its effects on limiting factors and project prioritization. The annual progress reports and comprehensive evaluations will also include new information on climate change and effects on listed salmon and steelhead. The agencies have provided specific means to implement different or additional actions in the event of unanticipated adverse effects of climate change on listed fish.

A section of the agencies' plan addresses long-term contingencies should the actions be unsuccessful in achieving performance standards after adaptive management and if the ESUs are not on track toward recovery. If there is a failure to achieve performance standards, the Action Agencies commit to explore contingencies, in coordination with states and tribes. These discussions would occur through a Regional Implementation Oversight Group (RIOG) that will operate on a model similar to the sovereigns' collaboration that took place as part of the remand process ordered by Judge Redden.

The agencies commit in the contingency plan to coordinate with states and tribes in an All-H diagnosis and a thorough consideration of ESU status and effectiveness of FCRPS actions. While some comments fault the agencies for lack of specificity in identifying contingency measures, NOAA Fisheries contends that what the agencies have provided is beneficial and represents what the agencies are realistically able to commit to based on the information they now have.

Issue 22: Comments on Collaboration in Implementing The FCRPS Biological Opinion

Comment 22-A *The Regional Coalition, the Colville Tribes, the Spokane Tribe, the Kootenai Tribe, Washington and Montana urge NOAA Fisheries' RPA to provide for a collaborative oversight body for implementation of the FCRPS Biological Opinion. Some comments suggested continuing the sovereign's-style Policy Work Group and provide a common table for sovereigns that have fish and water-management responsibilities impacted by the Biological Opinion.*

Response 22-A NOAA Fisheries has reviewed the FCRPS Action Agencies' proposal for collaboration and oversight during implementation of the RPA. The agencies have outlined an ongoing collaboration among federal agencies, states, and tribes centered on a Regional Implementation Oversight Group (RIOG). In the Biological Assessment, they laid out the membership of the RIOG and its responsibilities. NOAA Fisheries finds that the Action Agencies have described a workable process that satisfies many of the comments. It is not our wish to be more prescriptive about how the agencies and tribes carry out the oversight function. The region has considerable experience with such processes, and NOAA Fisheries is satisfied that the agencies have developed a structure and process that will be successful. According to the agencies' description, the RIOG would have a membership similar to the Policy Work Group in the sovereigns' collaboration, including senior policy representatives appointed by: federal executives for NOAA Fisheries, BPA, Reclamation, the Corps, and USFWS; governors for the states of Montana, Idaho, Washington, and Oregon; and tribal councils for tribal governments. The FCRPS Action Agencies have pointed out the need for a memorandum of agreement among the members to spell out operating principles and protocols and for subcommittees to oversee implementation actions in various areas.

The FCRPS Action Agencies have listed a number of specific responsibilities for the RIOG. In addition to reviewing and coordinating implementation of the RPA for the FCRPS, the RIOG will review the recovery actions of others, including states and tribes; resolve issues; promote coordinated funding and partnerships; coordinate Action Agency progress reports; and hold an annual meeting to review implementation and success in meeting performance standards. In 2018, the RIOG will consider the overall effectiveness of the Biological Opinion and consider whether a new RPA or extension of the existing one would be appropriate.

Issue 23: Comments on State Clean Water Act Certification

Comment 23-A *The Save Our Wild Salmon Coalition expresses a view that the actions included in this consultation should include a state water quality permit.*

Response 23-A Federal agencies are not required to obtain state certification as decided in the case of State of Minnesota v. Hoffman, 543 F.2d 1198 (8th Cir. 1976) certiorari denied 430 U.S. 977. NOAA Fisheries' incidental take statements, attached to biological opinions for federal actions, are not permits. NOAA Fisheries' permit issued to the Corps for its Juvenile Fish Transportation Program pursuant to ESA § 10(a)(1)(A) does not require state certification as clarified by the Hoffman case cited above.

Issue 24: Comments on the Estuary Habitat Effects Approach.

Comment 24-A O*regon suggests that there should be a sufficient backlog of estuary projects on shelf if replacement is needed.*

Response 24-A NOAA Fisheries agrees that having replacements projects identified would minimize any break in implementation should replacement projects be necessary.

Comment 24-B *The Lower Columbia River Estuary Partnership (LREP) encourages clarification about the relationship of the to-be-established group called for in RPA Action 37. LCREP states that it is possible that the Estuary Partnership Science Work Group could serve as the expert technical group.*

Response 24-B NOAA Fisheries agrees that the Estuary Partnership Science Work Group is one group that has the capability to serve in that role.

Comment 24-C *The Lower Columbia River Estuary Partnership (LCREP) suggests that more money for monitoring in the estuary would help the overall understanding of and recovery of the lower river and estuary.*

Response 24-C NOAA Fisheries agrees that additional information from estuary and lower river monitoring efforts would increase our understanding of the biology and ecology of the lower river and estuary. NOAA Fisheries anticipates that that information will need to come from a diverse group of agencies and programs and should be consistent with the monitoring frameworks, elements and objectives identified in recovery plans.

Issue 25: Comments on the Hydro Effects Approach

Comment 25-A *The Save Our Wild Salmon Coalition suggests the Biological Opinion does not employ the precautionary principal.*

Response 25-A The precautionary principal requires that when the effects of an action cannot be fully determined given available information, assumptions should be sufficiently conservative to ensure protection of human health or the environment. This approach is common to conservation biology and is widely employed by NOAA Fisheries. This Opinion incorporates the precautionary principal primarily in its use of alternative scenarios for future ocean conditions on salmon survival. Also, recent fish status and population growth data used to inform our Opinion comes primarily from the period 1980 through 2001. Overall, this period was dominated by poor ocean conditions and frequent droughts, conditions known to be a net drag on salmon populations. Thus, by creating fish population models from these data, NOAA Fisheries has adopted a precautionary approach to its analytical process.

Comment 25-B *CRITFC suggests the draft FCRPS Biological Opinion fails to use the best available scientific information and inadequately considers water quality, global climate change, critical habitat, or human population growth.*

Response 25-B Water quality effects in the environmental baseline are discussed in SCA Section 5.1.4 and 5.2. Anticipated water quality effects under the Prospective Action are qualitatively discussed in SCA Section 8.1. Further, the COMPASS model incorporates a water temperature model and incorporates the result of this model into its reservoir survival model. We expanded the discussion of climate change effects, both in the environmental baseline (SCA Section 5.7) and in the effects analysis (Section 8.1). The effects of anticipated human population growth are among the cumulative effects considered in this Opinion. The ISAB (2007a) identified the anticipated effects of human population growth and identified a series of recommendations. Those recommendations coincide with many of ISAB's recommendations for considering future climate change and are addressed in this opinion by many of the planning and habitat actions in the RPA.

Comment 25-C *Idaho Water Users identify a number of issues regarding hydrologic modeling conducted for this consultation. These concerns focus on discrepancies between current water consumption estimates and previous estimates and the differences between modeled results and recent data.*

Response 25-C These concerns apply to Reclamation's modeling approach and its Snake River version of the MODSIM model. NOAA Fisheries requested Reclamation to respond to these concerns. Reclamation responded by letter of February 18, 2008 (attached to this response). That response shows that the difference between Reclamation's prior estimate of water consumption are due to model refinements not merely changes in depletions caused by groundwater pumping. Also, the assertion that depletions could not be as large as Reclamation estimates because trends in annual runoff from 1911 at several USGS stations do not reflect substantial negative trends is explained by the fact that a large fraction of Snake River flows were already committed to irrigation by 1911.

Comment 25-D *CRITFC suggests, as outlined in the draft Biological Opinion, it [transportation] will reduce the survival of many of the listed species. No where in the draft Biological Opinion is juvenile descaling by the transportation system described, yet it is substantial.*

Response 25-D Descaling is a sublethal effect of juvenile collection and bypass systems at the dams. Transportation decisions are based on our current understanding of species benefit, measured as smolt-to-adult return ratios (SARs). To the extent that dam passage injury, including descaling reduces a juveniles likelihood of survival and adult return, the effects are captured in the SARs, such injuries are accounted for in our analysis. In some cases (e.g., early migrating SR spring-summer Chinook) smolt passage in-river results in higher SARs than transportation. These effects and NOAA Fisheries' approach to this issue are discussed in Chapter 11. Descaling is an inseason concern and the smolt monitoring program will continue to monitor descaling rates. When excessive descaling rates occur the facilities are inspected to identify and remedy the source.

Comment 25-E *CRITFC suggests the increased impacts to and losses of fish due to increased turbine passage rates (when voluntary spill is curtailed) are not considered in the draft permit.*

Response 25-E Project operations are not considered in the ESA Section 10 permit issued for the transportation program. The permit allows the USACE to collect and transport fish which enter turbine intakes rather than return them directly to the river. The relative efficacy of spill and transportation are considered in our analysis of effects (Chapter 8) and were fully considered in developing the RPA spill and transport schedules.

Comment 25-F *CRITFC suggests there is no SAR data for juveniles left in-river with 24 hour spill and reduction of load following in low flow years. Exclusive reliance on transportation without obtaining this important data does not follow an active adaptive management paradigm that the draft Biological Opinion claims to embrace.*

Response 25-F 2007 was a relatively low flow year during which there was 24-hour spill. Data from this outmigration will inform our adaptive management program. Available data (e.g., survival during high flow periods when load-following is impractical) do not suggest that load following has an effect on juvenile survival through the reservoir-dominated segments of the migratory corridor. In riverine sections downstream from hydro projects, efforts have been taken to limit flow fluctuations to protect incubating eggs from desiccation and emerged fry from entrapment and stranding.

Comment 25-G *CRITFC suggests the draft Biological Opinion continues the practice of transportation research which involves more transportation over more of the fish passage season, without consideration of less transportation.*

Response 25-G Transportation research is designed to answer questions regarding the efficacy of transportation. Through adaptive management, transportation research will guide our future use of transportation for more or less of the migration.

Comment 25-H *CRITFC suggests the draft transportation permit fails to include water quality or fish condition triggers that would terminate transport operations.*

Response 25-H Issues such as terminating transportation under certain water quality or fish conditions are addressed in the annual Fish Passage Plans which are reviewed regionally.

Comment 25-I *CRITFC suggests there are no specific numbers given for fish losses with respect to the overall migrating population in any specific year, only general mortality percentages at the dam bypass systems. So it is not possible to know what effect the transport operations will have on the incidental take of specific ESUs.*

Response 25-I ESA §10 requires the identification of the impacts of the exempted activity. In the case of fish transportation this impact would vary numerically as the size of the transported population changed. Thus, percent of mortality observed during collection and handling is a better determinant of impact than the number of mortalities. Both are recorded daily and reported weekly during the transportation season.

Issue 26: Comments on Juvenile Migration Flows

Comment 26-A *CRITFC suggests the draft Biological Opinion is less protective than current operations specified under the 2001 and 2004 Biological Opinions and the court for flow (Montana reservoir operations plan, Lake Roosevelt withdrawals, shift of some Upper Snake releases from summer to spring, consideration of seasonal flow targets as discretionary conservation recommendations).*

Response 26-A The hydro operations put forward in the current Biological Opinion are more protective than the 2000/2004 Biological Opinions and equivalent to the 2005+ operations. Hydro actions fall into three main categories: project configurations, project operations which include spill, flow management, and RM&E. Significant change has occurred in most of these action areas since the 2000 and 2004 Opinions were written.

The first area of progress has been project configuration. Surface passage was still in the design phase in the year 2000. Since that time major surface passage structures have been built, and tested. These include:

- Bonneville Dam corner collector
- Bonneville Dam biological guidance device
- The Dalles Dam spill wall and proposed extension of the spill wall scheduled for 2009 and 2010.
- John Day Dam surface passage device (2 TSWs) installed in 2008.
- McNary Dam surface passage device (2 TSWs) installed in 2007
- Ice Harbor RSW installed in 2004
- Lower Monumental Dam RSW operable in 2008
- Little Goose surface passage planned for 2009
- Ice Harbor RSW installed in 2001
-

Project operations, including spill volumes and spill schedules have been changed to provide improved passage past the projects since the 2000/2004 Biological Opinions and 2005 operation. These include:

- John Day Dam will initiate testing 30% vs. 40% spill 24 hours per day during the spring migration period. Prior to the 2008 season, spring spill was limited to 60% during nighttime hours at this project.
- McNary Dam has 24 hour spill during both the spring and summer period. The 2000 and 2004 Biological Opinions limited spring spill to nighttime hours and there was no summer spill at this project.
- Lower Monumental Dam provides spill 24 hours during the summer period through July and to the time in August when juveniles are actively migrating. The 2000 and 2004 Opinions provided no summer spill.
- Little Goose Dam provides spill 24 hours during the spring period. This project provided only 12 hours of nighttime spill in the 2000 and 2004 Biological Opinions. Also, 24 hours spill is provided during the summer period through July and to the time in August when juveniles are actively migrating. The 2000 and 2004 Opinions provided no summer spill.
- Lower Granite Dam provides spill 24 hours during the summer period through July and to the time in August when juveniles are actively migrating. The 2000 and 2004 Biological Opinions provided no summer spill.
-

Spring flow management measures have largely remained unchanged since the 2000 Biological Opinion. Summer flow management will change to evaluate the Montana Plan.

RM&E has expanded to include an evaluation of the estuary and ocean effects on survival and adult returns. RM&E has also played a key role in the evaluation of development of surface passage technology and its effectiveness. RM&E will play a key role in the adaptive management process and provide information to make the best informed decisions on hydro operations.

Reference to the Lower Granite Dam, McNary Dam, and Priest Rapids Dam flow objectives, which have been included in NOAA Fisheries' FCRPS biological opinions since 1995, was inadvertently left out of the RPA table. This oversight has been corrected. Managing available water resources to maximize potential fish survival is an objective of the annual planning process (i.e. Water Management Plan) and inseason management (i.e. Technical Management Team). Operations designed to maximize the probability of meeting the flow objectives, particularly during peak migration periods, is one aspect of maximizing fish survival.

Comment 26-B *CRTIFC suggests that "[r]eduction of summer flows reduces both juvenile and adult fish survival by increasing travel time, and increasing temperature which increases predator activity, disease occurrence, and loss of smoltification. Increased reduction of flows from irrigation and municipal withdrawals will be exacerbated by global warming from climate change. This cumulative impact is not noted at all in the draft BiOp."*

Response 26-B While not explicitly addressed in the Prospective Action, the anticipated growth of the region's human population is recognized as a factor affecting the probability for recovery (e.g., ISAB 2007). Because the Prospective Actions are designed to promote species recovery, the effects of human population growth have been implicitly considered. This consideration is similar to our consideration of the effects of global climate change where precise definition of future conditions is not possible but measures can be taken now and over the short term to proactively respond to anticipated future conditions. In most cases, future growth requires new water development and most new water developments require federal permits (e.g. Clean Water Act section 404 permits issued by the USACE). New water developments are one of the primary ways that population growth would affect ESA-listed fish species. Federal agencies issuing permits are obligated to evaluate the action's effects on ESA-listed species. Where future water development would require a Federal agency to consult with NOAA Fisheries under ESA §7(a)(2), NOAA Fisheries' goal would be to maintain or enhance the probability of survival and recovery established by this Opinion and completed recovery plans.

In the event that regional population growth presents new impediments to ensuring species survival and recovery not addressed by this Opinion, NOAA Fisheries may request a reinitiation of consultation on this and other completed consultations.

Comment 26-C *The Idaho Water Users claim that flow augmentation is not supported by substantial evidence.*

Response 26-C As noted by IWUA, the management of storage reservoirs to improve spring and summer flows in the Snake and Columbia rivers has long been a part of regional salmon survival and recovery efforts (originating in 1980). Considerable controversy has accompanied that program for this period, including a number of scientific reports. NOAA Fisheries acknowledges that available information can be interpreted to indicate that flow is only one environmental variable affecting migrating juvenile survival. Turbidity, water temperature, and date of release have also been shown to affect survival. However, as stated by the ISAB (2001b): "If flow correlates positively with survival, it may not matter whether this effect is mediated causally through the effect of flow on temperature, or turbidity, or water velocity, or unmeasured factors, as long as the result is higher survival." While available data show that the flow – survival relationship is non-linear (meaning that increasing flows is not always beneficial – increasing flows when flows are high does not increase survival), sufficient information is available to indicate that managing available water resources to increase the frequency and duration of flows at or above NOAA Fisheries' flow objectives is an important component of salmon survival and recovery. Flow augmentation contributes to this objective.

Issue 27: Comments of Water Quality Effects

Comment 27-A *"The draft BiOp states that "…high rates of involuntary spill are know to cause undesirable TDG conditions in the migratory corridor . . ." but fails to provide data to back up this statement. The TDG Risk Assessment in the 2000 FCRPS BiOp noted that fish had higher survival with TDG levels up to 125% compared to turbine passage."*

Response 27-A The frequency that flow attenuation provided by FCRPS reservoir refill reduces damaging levels of TDG is unknown, but past poor juvenile survival was often attributed to poor TDG conditions in the migratory corridor caused by excessive involuntary spill (Ebel et al. 1975). While substantial measures have been undertaken to minimize this effect (e.g. spillway flip-lips), the potential for high involuntary spills to cause gas-bubble trauma-related injury or death remains, particularly during wet years. This potential is reduced in some years by the attenuation of peak flows caused by operation of the FCRPS storage projects.

Issue 28: Comments on the COMPASS Model

Comment 28-A *CRITFC argues that the basic hydrological component of the model does not reflect actual daily flows, but is artificially derived. Both the State of Oregon and CRITFC suggest that the alternative model, the Comparative Survival Study, should be used to model proposed hydrosystem actions.*[1]

Response 28-A The objective of most Biological Opinion analyses was to estimate the effects of a management action on fish survival over a range of conditions likely to occur in the FCRPS over the course of the Opinion. The majority of the Policy Work Group recommended that BPA Hydsim output be used as input to the COMPASS model. Consistent with this recommendation, the COMPASS model analysis in the Opinion uses flows derived from the BPA Hydsim model. This model starts with the historical base flows of the 1927-1997 water record and applies current or proposed water management actions (withdrawals, etc.) to estimate the regulated river flows under those conditions. Hydsim produces estimates of monthly (bi-monthly in April and August) average flows and spill. To operate COMPASS, the collaborative group developed, reviewed and deployed a program based on current years' data that distributes the monthly average across daily time steps for all 70 years of the Hydsim output. In addition, the team developed relationships between seasonal temperature patterns and seasonal flow patterns to predict daily temperatures. These flows and temperatures, while synthetic, are derived from conditions historically observed in the FCRPS and recently observed relationships, and thus reasonably represent possible ranges of conditions expected to occur in the FCRPS in the near future. The Comparative Survival Study has not received independent

[1] See CRITFC comments p. 8 and Oregon comments p. 15

scientific review, and is not a functional model that would allow the types of analyses required by the FCRPS Biological Opinion, and so NOAA Fisheries concludes that it is neither practical nor appropriate for Biological Opinion analyses.

Comment 28-B O*regon criticizes that COMPASS relies on a combination of retrospective annual models.*[2]

Response 28-B Since one of the key objectives of COMPASS model development was to rely primarily on empirical data rather than inference, extrapolation, or untested hypotheses, it had to employ observed data from previous years.

Comment 28-C *CRITFC criticizes COMPASS for not utilizing a flow-survival relationship. Therefore it does not show differences in fish survival between a free flowing river and a reservoir.*[3]

Response 28-C The reservoir survival functions used in Compass include the following terms:
Chinook
LGR to Confluence:
$dist + dist*flow + dist*spill + tt + tt*temp + tt*temp^2$
Confluence to BON
tt
Steelhead
LGR to Confluence
$dist + tt + tt*flow + tt*temp + tt*temp^2$
Confluence to BON
$tt + tt*flow + tt*temp$
(where tt=Travel Time, dist=distance, and temp=temperature)

As can be seen from these equations, flow, or factors that are strongly related to flow such as travel time, are incorporated in all of the reservoir survival equations. Indeed, sensitivity analyses demonstrate that survival through the hydrosystem is responsive to flow. Further, simpler models proposed by CRITFC result in much poorer model fits when compared to recent data. Finally, as mentioned above, COMPASS can utilize a broad range of survival relationships, and we have incorporated the CRITFC model into COMPASS. However, since factors affecting survival, such a predator density are likely to be different in a free flowing river modeling of

[2] Oregon comments p. 12
[3] CRITFC comments p. 8

survival through a free-flowing river would require several simplifying assumptions.

Comment 28-D *Oregon argues that the model underestimates survival experienced by in-river fish under optimized flow conditions, particularly in the latter spring. Because of this, the model produces inflated transportation benefit results. Oregon suggests the model is biased because it primarily includes survival data from bypassed fish (instead on non-bypassed in-river migrants). Oregon believes that the evidence indicates that Chinook and steelhead bypassed juvenile fish have decreased SARs. They conclude that there is uncertainty in the use of bypassed fish in COMPASS to estimate SARs for steelhead that migrate in-river and are never bypassed.*[4]

Response 28-D NOAA Fisheries is aware of the "undetected fish" hypothesis. Smolts which were not detected between tagging and release at Lower Granite Dam as smolts and their return to the FCRPS as adults appear to return at a higher rate. However, it is not clear whether fish passing through bypass systems suffer latent mortality, as hypothesized by Oregon, or whether the relationship derives from the fact that smaller fish tend to be bypassed more frequently than larger ones and smaller also return at lower rates. In addition, the essence of the problem with this hypothesis lies in its nickname "undetected fish." Since they were not detected there is no way to be sure of their actual dam passage history by spill, turbine, or fish bypass (fish may pass through bypass systems undetected as tag detection efficiencies are less than 100%) or when they passed through the hydrosystem. By considering the low survival rates of fish passing dams via turbines and the relatively high detection rates of tagged fish passing via bypass one may make the inference that the fish passed exclusively by spill. The numbers of "undetected fish" observed to this point is also relatively small. Given the weakness of the inference and limited data currently available, NOAA Fisheries does not consider the "undetected fish" hypothesis to be strong enough to justify modifying passage models at this time. In the ISAB review of the Comparative Survival Study (CSS), they stated that the CSS group needed to consider fish detected at least once to analyses within season patterns.

Comment 28-E *Oregon, CRITFC and the Save Our Wild Salmon coalition*[5] *argue that COMPASS is based on data from a limited number of years and only for 2 species (Snake River spring/summer Chinook and steelhead) and the relationships it examines are limited by the available data set, which does not contain the recent years with relatively high spill percentages in the latter part of the spring.*[6]

Response 28-E The primary data for COMPASS (PIT-tag data) covers an extended time period (1997-2007) and a wide range of

[4] Oregon comments p. 12-13
[5] SOS comments p. 12-13
[6] Oregon comments p. 13

conditions. NOAA Fisheries concurs that limited data exist for ESUs other than Snake River spring migrants. The amount of data for upper Columbia Chinook and steelhead is limited. Comparisons of available Upper Columbia fish data were made with Snake River fish data for lower Columbia River behavior and survival. Where it was found that there was not a great difference between the stocks, the more data-rich Snake River stocks were used as surrogates. When making decisions based on limited information, NOAA Fisheries considers that inference from the established body of data is a more valid method than inference based on little or no data. As empirical data on the effects of the conditions described above (relatively high spill percentages) on smolt passage and survival are currently unavailable, there is also no empirical information that supports the hypothesis that those conditions are significantly different from those inferred from observed conditions.

Issue 29: Change in Reclamation flow augmentation release schedule.

Comment 29-A *Moving the emphasis of Reclamation's flow augmentation program from summer flow augmentation toward spring augmentation would adversely affect SR fall Chinook salmon.*

Response 29-A Reclamation's proposed change in its flow augmentation schedule was proposed at NOAA Fisheries' request for several reasons:

- To improve migration conditions for spring migrants, especially SR spring-summer Chinook and steelhead,
- To place Reclamation's mitigation effort on the species most clearly affected by its operations,
- To reflect the recent observed timing in juvenile SR fall Chinook migration, and
- To improve the ability to control lower Snake River water temperatures.

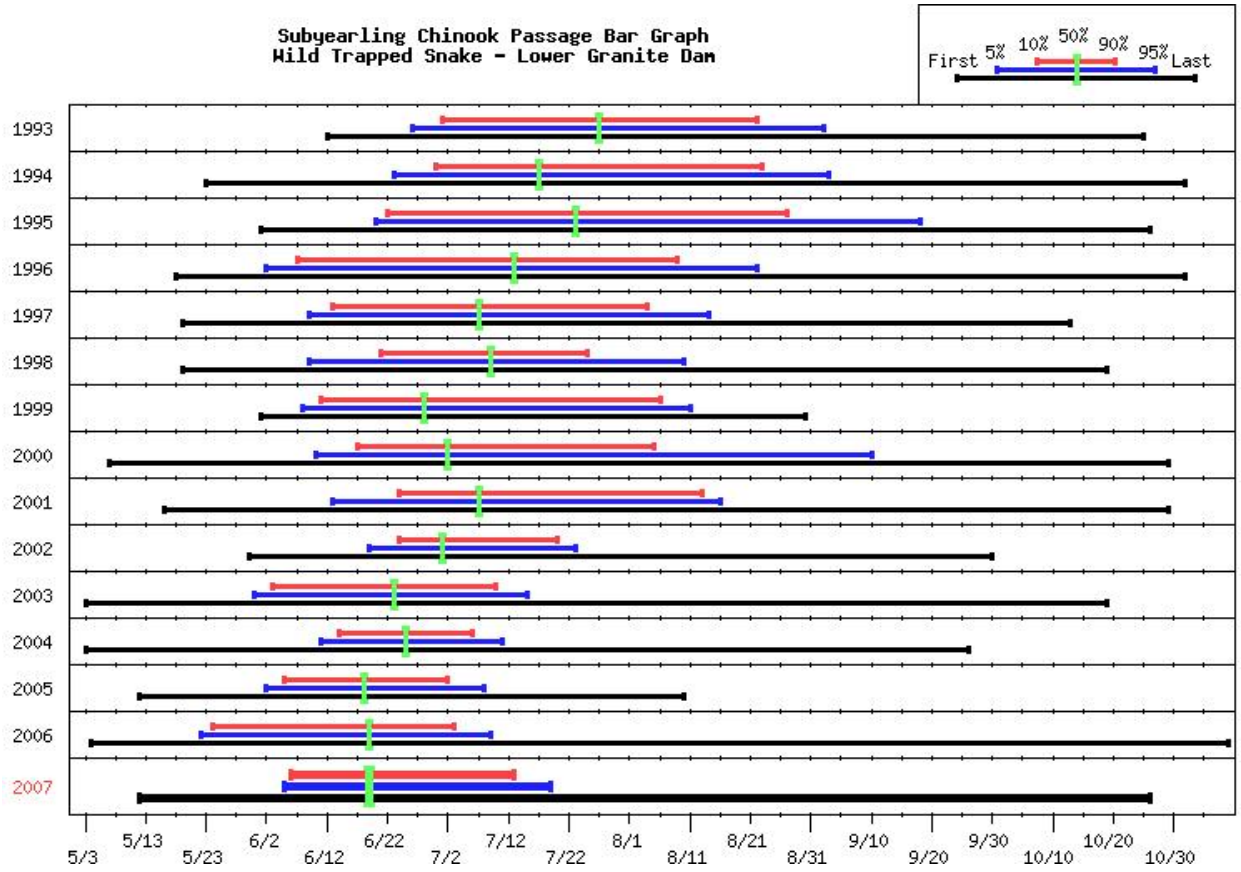
Table S-S shows the estimated change in flows downstream from Hells Canyon Dam under Reclamation's current augmentation program and its proposed action. This table shows that under Reclamation's proposed action, mean July and August flows would be reduced by about 1,450 cfs while May and June flows would be increased a similar amount.

Table S-S. Simulated mean monthly discharge from Hells Canyon Dam under Reclamation's current augmentation program and its proposed action.

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Current	15074	9849	15305	18597	25110	23217	30028	27555	21987	17045	11228	13303
Prospective	15079	9848	15305	18597	25105	23217	30028	29199	23275	15599	9784	13303
Difference	**5**	**-1**	**0**	**0**	**-5**	**0**	**0**	**1644**	**1288**	**-1446**	**-1444**	**0**

Recent research on juvenile SR fall Chinook verifies that a strong and consistent relationship exists between flow and travel time from release points in the free flowing Snake River reach to Lower Granite Dam (Smith et al. 2003). Smith et al. (2003) also showed that similar relationships exist between temperature and survival (survival improves as water temperature declines) and between turbidity and survival (survival improves as turbidity increases), which are also correlated with flow. Further, all of these factors are strongly related to date in the season. NOAA Fisheries continues to support flow augmentation to improve the survival of actively migrating juvenile SR fall Chinook salmon in the Snake River.

After July 1, to protect migrating SR fall Chinook juveniles the discharge rate and discharge water temperatures at Dworshak Dam, located on the North Fork Clearwater River, are managed in an effort to minimize the magnitude and duration of exceedences of 68 ºF (20 ºC) in water discharged from Lower Granite Dam. During this period, water temperatures in the Snake River upstream from the head of Lower Granite pool often exceed 68 ºF and the greater the discharges at Hells Canyon Dam, the more difficult it becomes to maintain suitable water temperatures in the lower Snake River. Further, growth of the juvenile SR fall Chinook in the lower Clearwater River can be slowed by the release of cold water from Dworshak Dam needed to provide suitable conditions in the lower Snake River. There is a trade-off between providing higher flows in July and August to improve fish travel times and survival and maintaining suitable water temperatures in the lower Snake River. However, excessively warm water temperatures can have acute effects on fish survival, both directly through temperature stress and indirectly through disease virulence and infectivity.



KEY: Median passage dates are indicated by vertical green bar; 10th to 90th percent passage dates by red line; 5th to 95th percent passage dates by blue line; and first and last detection by black line.

We also have a better understanding of SR fall Chinook life history with the recent observation that a significant portion of the population over-winters in reservoirs and migrates out of the hydropower system as yearlings the following spring rather than migrating directly to the sea as subyearlings (Connor et al. 2005). This is termed a yearling life-history strategy. Many of the naturally produced fish exhibiting this life-history strategy appear to be coming from the cooler Clearwater River system (Figure 3). Those fish that do migrate as subyearlings have shifted their outmigration timing progressively earlier since the 1990s. In recent years (2004 to 2006) most (95%) of the migrating SR fall Chinook have passed Lower Granite Dam by mid-July, with this date corresponding to an apparent marked increase in the proportion of fish ceasing migration (Cook et al. 2006).

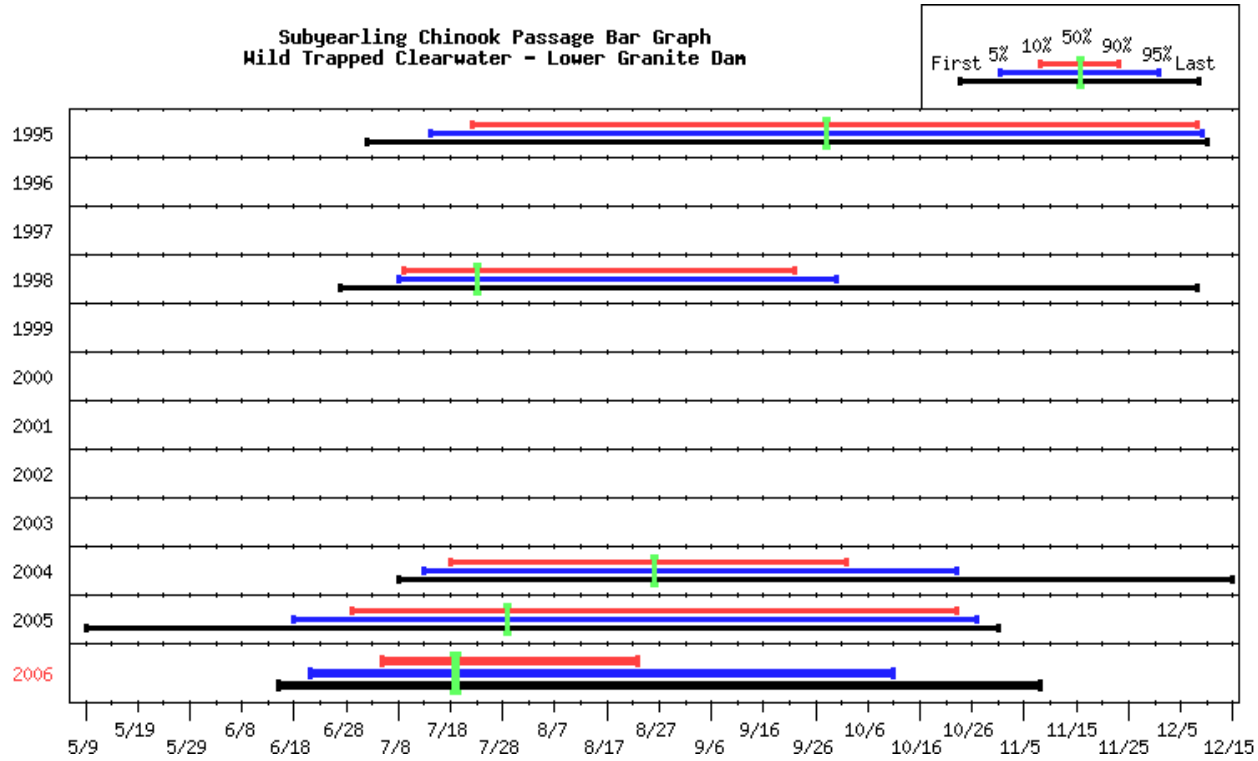


Figure 3. Migration Timing of wild PIT tagged juvenile fall Chinook salmon tagged in the Clearwater River at Lower Granite Dam.

NOAA Fisheries concludes that by increasing flows during June, the survival of the large fraction of juvenile SR fall Chinook migrating at that time would be improved and that during July and August, reducing the flow of warmer Snake River water entering Lower Granite reservoir would help to maintain non-lethal water temperatures in the lower Snake River. This water temperature effect would benefit both active summer migrants and fish destined to remain in the reservoir system and migrate after September 1. The primary purpose in this proposed change in timing is to benefit spring migrants, particularly SR spring-summer Chinook and steelhead that have population metrics which suggest they are at greater risk that SR fall Chinook. Also, hydrologic analysis has demonstrated that the primary effects of Reclamation's proposed action is the reduction of spring flows, primarily May and June, and moving a larger portion of the augmentation water into May and June would place the mitigation value on the affected species. Juvenile survival monitoring will continue throughout the life of this Opinion and in the event that new data indicates that this new flow augmentation schedule is counterproductive, NOAA Fisheries would request that Reclamation revise its flow augmentation schedule accordingly.

References See SCA Chapter 12: Literature Cited

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